DOCUMENT RESUME

ED 023 451 PS 001 179

A Study of Visual Perceptions in Early Childhood.
Western New Mexico Univ., Silver City.
Spons Agency-Office of Education (DHEW), Washington, D.C.
Report No-OEO-2400
Pub Date [67]
Note-95p.
EDRS Price MF-$0.50 HC-$4.85
Descriptors-American Indians, Conservation (Concept), *Cultural Disadvantagement, Cultural Factors, Ethnic Groups, Interaction, Mexican Americans, Perception Tests, Perceptual Development, *Preschool Programs, *Rural Youth, Sensory Training, Space Orientation, *Visually Handicapped, *Visual Perception
Identifiers-Frostig Visual Perceptions Test, *Project Head Start

Over a period of three years a group of 510 rural children participated in a study of visual perceptions, including eye motor coordination, discernment of figures in a ground pattern, form constancy, position in space, and spatial relations, as measured by the Frostig Visual Perceptions Test. Visual perceptions of children of other cultures were compared to those of children of the dominant Anglo-Saxon culture. The relationship of visual perceptions to cultural deprivation was also studied. The development of children's visual perceptions over a period of 18 to 25 months and the effectiveness of various types of programs in improving a child's visual perceptions were investigated. Results of testing showed that all rural children scored low in form constancy. Culturally deprived children scored lower in all perceptions, but visual perception handicaps were sometimes as great as eight times that o f control group children. The valus of the Frostig developmental training program was demonstrated. Pupil progress was retained for at least one academi c year. The study concludes that visual perception handicaps result from cultural deprivation rather than from participation in a nondominant culture. Implications are that rural children would benefit from form constancy training during their first year at school. (MS)

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WESTERN NEW MEXICO UNIVERSITY
SILVER CITY, NEW MEXICO

ED023451

A STUDY OF VISUAL PERCEPTIONS IN EARLY CHILDHOOD

With special emphasis on the relation to culture-deprivation and membership in the non-dominant culture and the effectiveness of various developmental programs.

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ABSTRACT

A three year study of children's visual perceptions as measured by the Frostig Visual Perceptions Test was conducted at Western New Mexico University, Silver City. This investigation involved five hundren ten children who were tested one to six times with Frostig and at least utilizing one other test. Four phases of the subject were investigated. The principal investigators were David M. Dennis and Mary Norris Dennis.

First, the relation of visual perceptions to cultural deprivation and to membership in a non-dominant culture (referred to as a "non-culture") was investigated. Culturally deprived children in Silver City (Grant County), New Mexico, Laguna Indian Pueblo, and on the Navajo Reservation were compared with children of the dominant culture of Mexico and Navajo culture (non-culture).

The first phase showed that non-dominant culture children had the same perceptions except in position in space. On the other hand broad differences were observed when compared with culturally deprived. In a typical group of children, one out of six is handicapped in eye motor coordination and position in space, one out of three in form constancy. Non-culture group score about the same. The one exception is in the incidence of handicap in position in space which is twice as great. It is tripled in culturally deprived. Navajo children score same in spatial relations, but Laguna have four times the handicap and culturally deprived had six times. Medians and averages showed a somewhat similar relationship.

The second aspect of the study regarded the finding of the most effective program for overcoming perceptual difficulties. Nursery, adjusted nurseries, kindergarten, Head Start (adjusted kindergarten), first grade and other programs for culturally deprived were investigated. These programs were compared to the Frostig Developmental Training Program. The comparison revealed that although gains were shown by children in all programs, particularly in eye motor coordination and figure ground, the only overall significant gains were made in the Frostig training. A second training program only benefitted children with the most severe handicap. Perceptual handicaps

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are seen as threshold factors because as little as one hour's training on a single perception, presented in five minute sessions resulted in gains of two to three points. The gains persisted for the academic year following the training.

The third phase concerned the way the Frostig test correlated with other tests. The correlation with Lee Clark varied from group to group, but was .56 for 97 experimental and .53 for 113 control children. The Metropolitan Readiness Test correlated lower at .34.

Correlations with mental ability tests showed that the Peabody Picture Vocabulary Test had a correlation comparable to that of the Lee Clark as did the Lorge-Thorndike, but the California Mental Maturity and the Vineland were lower, and the Goodenough-Harris was lowest at .24. A comparison of these with the correlations derived by other investigators in the literature showed that they were approximately the same.

The last phase of the study concerned a selected group of sixteen children who had taken five or six Frostig tests and twenty-five children who had been in the program for eighteen to twenty-five months. The result of this investigation showed that children did in fact make progress in most perceptions. The one exception was in form constancy. Eye motor coordination remained questionable.

Throughout all phases of the study, it was evident in the data that all children which means all rural children, suffer from a perception handicap in form constancy. Since the Frostig Visual Perceptions Developmental Training Program was beneficial in overcoming a handicap, it was the recommendation of the investigators that visual perceptions training in form constancy should be made a part of every rural child's first grade program.

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A STUDY OF VISUAL PERCEPTIONS AS RELATED TO CULTURAL DEPRIVATION

OEO Grant No. 2400

BACKGROUND

This project had its beginning during the summer of 1965 when two rooms of Head Start children were tested for visual perceptions* at the conclusion of the head Start program. The results of the test indicated that culturally deprived children suffered greatly in the area of visual perceptions.

In order to provide comparable age group data, Nursery, Kindergarten and First Grade at the Teacher Education Center, Western New Mexico University were tested in the fall of 1965. Results of these tests indicated that children attending the Teacher Education Center, which may be considered a normal to high culture group, were quite advanced in visual perceptions.

Several more problems were investigated during the school year 1965 to 1966. For example, the role of a total Frostig developmental training was investigated. The effect of Kindergarten and Nursery training was researched. The effect of giving test instructions via English or Spanish only as compared with a combination of these languages was also researched. In the spring of 1966 investigation was begun on a group of culturally deprived children which consisted of three classrooms enrolled in a program called the Child Development Center. One of the questions to which the answer was sought was: "What kind of training would be most beneficial in developing the students' visual perceptions?" Another question was whether or not visual perceptions were a result of the culture deprivation or of the differences existing between the established culture and the culture of another ethnic group.

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*Visual perceptions in this investigation are considered to include five types:

Eye motor coordination
Discernment of figures in a ground pattern
Constancy in form discernment
Orientation or position in a space context
Pattern repetition or spatial relations

A research proposal was submitted to the Office of Economic Opportunity soon after the beginning of the Child Development Center program in March, 1966. This proposal was followed by another proposal in June of 1966. Since no decision had been made on the proposals by the fall of 1966, Western New Mexico University undertook the testing of the children who were in that 1966 program and which concluded at the end of the summer of 1966.

The 1966 - 1967 Child Development Center children were not tested right away in the hopes that the grant would be forthcoming and therefore money would be available for the project. However, when it became obvious that the decision was going to be delayed, testing was carried out under the auspices of the University. None of the tests were graded, tabulated, or analyzed until the grant was made. The grant,no. OEO 2400, was made January 1, 1967.

The problems investigated under this grant include the following:

1. What is the relationship of Anglo-Saxon culture to visual perceptions?

2. What differences are there in visual perceptions between Anglo Saxon and non-Anglo-Saxon culture? Non-Anglo-Saxon is taken to mean Mexican Nationals and Indians. Two types of Indians were investigated:

   a. Pueblo (Santo Domingo)

   b. Nomadic (Navajo)

3. What is the relationship of visual perceptions to cultural deprivation? A child is considered to be culturally deprived for the purpose of this investigation if he has been enrolled in a culturally deprived program. Culturally deprived children fall into two categories in this study, i.e., the Indian program and the Non-Indian program.

4. What is the most beneficial program that may be adopted for assisting students in overcoming their visual perceptions difficulties? This branch of the investigation has centered around the following types of programs:

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a. Typical Nursery

b. Typical Kindergarten

c. Nursery adjusted for the needs of culturally deprived

d. A First Grade Reading Readiness Program

e. The Frostig's developmental program

5. It had been planned to investigate the relationship of visual perceptions among Indian children and Indian parents. However, a preliminary test of the instrument given to parents of Santo Domingo Indian children in the culturally deprived program revealed that the parents made a perfect score. Therefore, no comparison could be made until a more difficult instrument is devised.

6. A problem which was not originally contemplated, but which seems to have a strong bearing on this subject is the critical examination of the Frostig Visual Perceptions Test itself. A search was made for another test which might be used to measure visual perceptions, but none as complete as Frostig has been found. The closest related instrument was the Lee Clark Reading Readiness. Therefore, an investigation of the correlation between Lee Clark Reading Readiness and Frostig was undertaken. Correlations were obtained on children who were just finishing a Kindergarten program or were at the beginning of the First Grade. Correlations were also obtained between the Frostig and several other instruments.

7. The persistency in gains or losses as revealed by visual perceptions scores was studied for the purpose of determining the ultimate effect of perceptions training and the constancy of the test instrument.

8. Since a number of children had received tests over a rather long period of time (one and one-half to three years), data on these were assembled and analyzed.

The above questions will be analyzed in their respective order.

GENERAL CONSIDERATIONS

The Frostig Visual Perceptions Test. As previously stated, the Frostig visual perceptions consist of five subtests. Each of these subtests results in a scaled score which varies from 1 to 20 although scores below 4 and over 16 are practically impossible to secure. A total of these scaled scores yields a score which is used to enter on a table where a perceptual quotient is found. Since a normal scaled score on any subtest is 10, then a normal total scaled score would be 50 and the normal perceptual quotient is 100, or twice that of the normal scaled score. Thus, the perceptual quotient generally is double the scaled score total. The perceptual quotient also can be utilized to determine the percentile rank the subject would be equivalent to in a normal population.

Diagnostic aspects. As previously stated, the Frostig Test is broken into 5 subtests. Each of the perceptions covered in a subtest are said to have some relation to a child's learning how to read. As research into visual perceptions progressed, the importance of the test as a diagnostic instrument became quite apparent. Thus, a child who might score high on all other subtests, might be considerably weak in one single subtest. This investigator made considerable classroom observation on children who had performed in such a manner, that is, were weak in one perception only. He found that generally the child would,in fact, display a certain incapacity in learning how to read due to this handicap. Thus a child who scored low in Position in Space often displayed reversals in writing his letter or reading words. Contrarily, children who displayed these characteristics when tested were found to fall below normal in the pertinent visual perception.

Another ramification of this diagnostic feature was that children who scored high were not able to learn to read any better as a result of this high score.

Thus children in the 1965 Teacher Education Center First Grade, when given intensive training in visual perceptions, did not learn to read significantly any better than children in the 1966-1967 first grade classroom. The conclusion, therefore, is that visual perceptions is very similar to ordinary vision. A child who has excellent eyesight cannot learn any better than a child who has normal vision. On the other hand, a child who has poor eyesight and no correction is handicapped in learning.

A child who has a scaled score of 10 on a subtest is considered to be normal, and a score of 9 is not considered unusual, but any child under 9 is considered to have a visual perception handicap on that perception. This study has given considerable attention to the child who received scores under 9. As will be seen in the following pages, the statistics are often dramatically altered when only scores under 9 are examined.

The fact that children often scored low on one subtest while performing normally or better on other subtests lead to the conclusion that training to overcome visual perceptions difficulties would have to be customized to the individual learner. As the study progressed in time, the investigators attempted to develop individualized developmental training and to analyze the results of such training.

Urban standardization. As the investigation progressed, several discrepancies were found to exist between the population covered in this study and the so-called normal population. A discussion with Dr. Frostig and her statistical consultant, Mrs. Maslow, revealed that the test had been standardized on urban populations. The subjects tested in this investigation can be considered to belong to a rural population. The largest community from which our subjects were drawn, Silver City, has only 10,000 inhabitants. While this fact does not negate the findings of the study, it does indicate that a further study which would yield a standardization based on rural populations is needed. The investigators of the present study intend to undertake such a study sometime in the near future.

PHASE I

RELATIONSHIP FOR VISUAL PERCEPTIONS TO CULTURE AND CULTURALLY DEPRIVED

The cultural relationship of visual perceptions was the prime topic of this investigation. In order to establish this relationship, the following groups have been tested:

		Rooms
1965	Summer Head Start Program	2
1967	Summer Head Start Program	4
1965-1966	Child Development Center	3
1966-1967	Child Development Center	3
1967-1968	Child Development Center	3
1966-1967	Santo Domingo	2
1967-1968	Santo Domingo	2
1967-1968	Navajo Preschool	4
1966-1967	Crownpoint	
	Experimental	1
	Control	1
1965-1968	Teacher Education Center	
	Nursery	3
	Kindergarten	3
	First Grade	
1965-1968	Deming, First Grade	2
	Silver City, First Grade	1
	St. Mary's Kindergarten	2

The sixteen subgroups, comprising some thirty-nine classrooms, were combined to produce comparisons of groups as follows: all Child Development Center, all Silver City culturally deprived, all culturally deprived, all experimental, all Navajo, all Santo Domingo, all Mexican Nationals, all Non-Anglo-Saxon culture, all Nurseries, all Kindergartens, all First Grades, all Silver City Control, all Deming and all control groups. Chart 1 demonstrates how these groups were combined.

Data resulting from the testing of individual groups and the combination of the various groups were presented in terms of median percentile scores and the number of subjects included in that group.

The total scaled score for each child was converted according to his age to a perceptual quotient score. While the perceptual quotient has relatively little value in the developmental program, (see General Considerations) the percentile rank derived from this quotient is very useful in making an overall comparison of one group with another. The median percentile score has been chosen here because it was noted that often a few children were found in a culturally deprived program whose perceptual quotient score was very high and if a mean average were to be taken of the group, it would appear that the group had a standard score which was much higher than the circumstances warranted. On the other hand, the median score gave a more realistic picture of the circumstances. As a matter of fact, the same logic can be applied when testing high ranking groups. In this case, a few very low scores can lower the overall mean average quite considerably in relation to the true circumstances. Again, the median score gives a truer picture of the circumstances.

The various groups which were tested are presented in Chart 1. This chart also reveals how various groups were combined in order to analyze the findings of general populations. In general the objective was to obtain median percentile ranks of Indian and non-Indian culturally deprived (experimental) Mexican nationals, and non-culturally deprived (control) Indians and non-Indians.

Table 1 presents the median percentile score as well as the number of subjects involved in each group. The figures for Table 1 were derived from Frostig visual perception scores made by the child on his first test after enrolling in a particular program. For example, a child who re-enrolled in a Child Development Center program the second year was represented only in his very first test; a child who enrolled in the 1967 Head Start program after having been in a 1966 Child Development Center program was excluded likewise; and a child who enrolled in the first grade at Teacher Education Center after having had kindergarten training there was not included the second time.

Culturally Deprived. Two types of programs for the culturally deprived exist in the Silver City area. One is called Head Start and this term is used to indicate a program of shorter duration -- six to eight weeks in length. The other program is called Child Development Center and consists of a program which closely approximates an academic year in length. It has been noted previously that the Child Development Center programs drew children from Hurley, Bayard and Central as well as Silver City, but since Child Development Center children were administered through Western New Mexico University, the term Silver City is used in this report for all Child Development Center programs.

The median of culturally deprived children in the Silver City area varied from a low of two percentile to a high of twenty-one. The children in earlier programs tended to score lower than children in later programs. For example, 1965 Head Start children ranked at the 6.75 percentile while 1967 Head Start children ranked at the 7.5 percentile. Child Development Center children in the 1965-1966 program had a median percentile of 9; in 1966 it had risen to 16, and the median percentile rank was 24. This finding may be explained by the fact that parents are becoming more knowledeable on child rearing. The median of all Child Development Center children was 16 and all culturally deprived children in the Silver City area was 14.

Indians. An examination of the Indian children (Laguna and Navajo) presents quite a different picture. Scores were much higher among the Indians. The lowest median percentile was 30 received by the Crownpoint first grade children who had been in the 1966-1967 preschool training program (Crownpoint Experimental); and the next lowest was the 1967-1968 culturally deprived program at Paraje which is a school belonging to the Laguna Pueblo Tribe.

The highest percentile rank was found deep in the Navajo Reservation at White Cone where the children had a median percentile of 70. The median for both Navajo and Laguna culturally deprived children was found to be 45 which is certainly within experimental error of a general population norm. Of course, the comparison was not very meaningful, but when the Indian culturally deprived children were combined with the Silver City culturally deprived children, the median was found to be 20. Almost 300 children were involved in this combination.

NON-CULTURE GROUPS

Mexican Nationals. The non-culture groups include Mexican Nationals and Indians. The Mexican Nationals in turn consist of two groups called Columbus and Palomas which are the names of the towns where they were tested. The Columbus group consisted of a classroom at the Columbus school which is a public school of the United States. All the children in this room are citizens of Mexico and reside in the town of Palomas, three miles distant, from which they commute. These children have the advantage of a good school and a certified teacher. The program offered them might be called a modified kindergarten. In New Mexico such programs have been offered for forty years or more under the name of Pre-First. The main objective of these classrooms has been to teach a child how to speak English. This program had been altered by the teacher, Mrs. O'Brian, to include activities which were aimed at overcoming deficiencies in the children's experimental background.

The children from Palomas were drawn from two groups. One group had gone to school for one year and presumably had taken academic subjects. The other group were not yet old enough to enroll in the first grade. As might be expected, an examination of the table revealed broad differences in scores made by the children in Columbus as compared with Palomas. The Palomas sub-groups were so small that little significance could be derived from separate analysis, but such an analysis did reveal that Palomas children who had schooling did not receive scores any higher than those who did not. The median of Columbus Mexican Nationals was 39 which was very close to that received by Indian children enrolled in culturally deprived programs.

Indians. The Indian children's group is comprised of three sub-groups. These are the Laguna Pueblo, the Navajo culturally deprived and the Navajo control group (Crownpoint control). The Navajo control group was determined as those children who in 1966-1967 were of the same age as children chosen for pre-school culturally deprived programs but who were not chosen. The fact that they had not been chosen was used to indicate that they were not culturally deprived and therefore to be considered a control group. The Laguna Indians were all enrolled in culturally deprived programs and as a previous analysis revealed, they had a median percential of 38.5. The median percentile of all Navajos tends to be slightly higher than this since the Crownpoint control group had a median of 50 percentile. The total of all Indian groups also yielded a median of 50 percentile. When all Indians were combined, a median percentile of 45 was obtained, and when this group was combined with the Mexican Nationals, a median of the 49th percentile was obtained.

Visual Perceptions vs Cultural Deprivation and Non-Culture. Since the question had occured as to whether visual perceptions were related to cultural deprivation or simply to cultural differences, another analysis of these data was made.

This analysis examined the Silver City culturally deprived children in relation to Mexican Nationals. This comparison is apt because in general 90% or more of the children in the Silver City culturally deprived program have Spanish surnames. The Mexican National children all had Spanish Surnames. Such a comparison indicated that cultural deprivation did in fact lead to a lower visual perception score, the percentile rank of Silver City children being only 14 whereas the Indian pre-school and all Mexican Nationals was 30.

The figures for Indian children were even more revealing. Indian children tended to score normally and the median percentile of the culturally deprived Indian children was even higher than the score for Mexican Nationals who had been in the United States school program. This finding revealed that differences in culture had little or no effect on a child's visual perception. On the other hand, the lack of experiential background with cultural significance did lead to a lower visual perceptions score

Non-Indian - Mexican Control. As previously stated, the control group was considered to include children who had not been chosen to participate in a culturally deprived program.

The control groups in Silver City fall into three categories -- the children enrolled at the Teacher Education Center. The Teacher Education Center is a research facility funded by the State of New Mexico and administered through Western New Mexico University. Second, public schools which include Sixth Street Elementary and North Silver Elementary. The third group consists of children enrolled in St. Mary's Inter-Parochial School. In addition to the Silver City control group, two schools in Luna County located in the town of Deming were included in this study. Deming is located at a distance of 52 miles south of Silver City and is approximately midway between Silver City and the Mexican border. It was chosen because the culture has predominantly Latin-American flavor and because it contained two elementary schools -- Bell and Martin -- which have a large number of low income culture groups. No official Head Start program was conducted in these schools.

The children in all of the schools, except for the Teacher Education Center, had a high percentage of Spanish surnames. Several of the children in the Deming schools who did not have Spanish names were of Negro origin.

Teacher Education Center. Children in the nursery, kindergarten and first grade were tested each year from 1965 through 1968. The medians obtained from these nine classrooms varied from a low of 14 percentile received by the 1965-1966 nursery to a high of 68.5 received by the first grade in 1965-1966. Median rank for combined groups varied from a low of 25.5 for nursery through 40 for first grade to a high of 55 for kindergartens. No particular trend is seen here. For example, the lowest nursery score occurred in 1965 and the highest in 1966 while kindergarten followed a similar pattern. The first grade had its highest score in 1965 and the lowest score in 1967. The combined median percentile for all the Teacher Education Center children was 40 which was the same as the combined percentile of Mexican Nationals and Indian children. This fact again indicated that visual perceptions had little relationship to the culture of the group.

Another fact which should be noted here is that nursery children tended to score lower than the other groups. This investigator had made a separate study of scores obtained by children according to their age (see WRI TL, Volume II, Issue 4, pp 12-18). This study revealed that culturally deprived children scored highest in the youngest age group and that the median scores tended to drop as the children grew older. This tendency was not at all unexpected because the young children were low to begin with. The three year old median percentile was 22 as compared with 7 for five year olds. Psychologically, it is a well-known fact that a low scoring child tends to drop even lower as time goes on. The average for nursery children at the Teacher Education Center was slightly higher than culturally deprived three year olds. The fact that children enrolled in kindergarten and first grade scored higher probably was the result of nursery, kindergarten and home training received by the control group children before entering the first grade.

Other Silver City Schools. Although two public schools were tested in Silver City, the number of subjects involved (36) is low. The reason for this is that children were tested in the first grade and while almost 70 children were tested, only the ones who had not been enrolled previously in any program -- nursery, kindergarten, Child Development Center or otherwise could be used in the present analysis. The median percentile was rather high -- 6.

The Silver City schools do not have a kindergarten program. Therefore, testing of kindergarten age children at St. Mary's school were included. The kindergartens at St. Mary's and the Teacher Education Center are the only ones in the Silver City area. Both these programs were conducted by certified kindergarten teachers. The median for St. Mary's was 69 which was somewhat higher than the median at the Teacher Education Center. When the two kindergartens were combined, a percentile of 60 was obtained. This was the same as all combined Silver City schools. It was quite gratifying to note that the combined total of all Silver City control group children was 50. This finding indicated that the control group was truly a normal group.

Deming Schools. The two schools included in this study which were located in Deming were populated by children of low income-culture groups. No culturally deprived program was offered in Deming. This investigator is certain that many of the children included in these schools would qualify as culturally deprived. The median percentile for Deming schools (35) was very close to that received for Mexican Nationals. It is lower than Silver City control groups. Thus a combination of control group children in the Silver City and Deming area yielded a lower percentile of 42. When combined with the Indian control group, the percentile is once again raised to 50. The children in the Deming schools were first graders and therefore a combination was made between those children, the Silver City public schools and the first graders at the Teacher Education Center. This combination yielded a median of 60.

The combined median percentile of all control groups of 50 percentile is considerable higher than the combined median percentile for culturally deprived groups which was 20. There were 226 children involved in the control group and 284 in the culturally deprived, or approximately 500 children.

INDIVIDUAL TYPES OF PERCEPTIONS

The value of the Frostig visual perceptions test is not in the overall perceptual scores but rather in the fact subtests can diagnose perceptual weakness (See General Considerations). To attain the greatest effectiveness, the procedure consists of administering the Frostig test in a pre-training situation to diagnose the weakness children have in individual perceptions and to then administer developmental activities peculiarly adapted to each child's needs. Such a procedure inevitably leads to the observation that broad differences in individual perceptual abilities exist among various children. A study of the cultural relations of visual perceptions cannot be complete without an examination of differences existing among groups according to their individual perceptions. The individual perceptions in each of the stutests covered has been standardized on a normal population although the children in the population norm were all urban dwellers. A standard score of ten is a normal score. Therefore, an examination of each of the individual perceptions which consists of a comparison of mean average for each group should indicate not only the differences among cultures, but also the difference between urban and rural children. The latter is indicated by analyzing control groups versus the urban norm. The data obtained from analyzing the individual classrooms is presented in Table 3. The data for individual groups in this table has been arranged in the same manner as groups were organized in Chart 1.

CULTURALLY DEPRIVED GROUPS

The early programs showed a significant difference from those later on in eye motor coordination. For example, the highest mean in this perception of 6.5 was received in Mrs Fox's room. This average was still .2 lower than the lowest score received by the later culturally deprived programs in the Silver City area. Since these were averages based upon the child's first entering upon a program, that finding cannot be attributed to a child's having had some previous training. On the other hand, the higher scores made by a subtest in 1966 and 1967 might have been the result of better home training.

An examination of figure ground averages revealed a low of 6.5 to a high of 8.9. In general no particular pattern evolved here. The Child Development Center children tended to score about the same each of the three years and scores among the various classes also had some variation which tended to be approximately equal after three years. The Child Development Center averages seemed to fall between the 1965 Head Start classes and the 1967 Head Start classes.

Form constancy showed a much wider range of values than figure ground. The lowest score was 6.2 and the highest was 9.6. It might be noted, however, that the 9.6 was made by a 1965 Child Development Center classroom which consisted almost entirely of three and four year old children. The 1967 - 1968 Child Development Center children included here were approximately the same as in the two Head Start programs. When the Child Development Center program was compared with the two Head Start groups, the Child Development Center children fell within the range of the other two groups. When the high score (9.6) was eliminated, the rest of the scores fell within a rather narrow range, the highest score being 8.2.

Means on position in space for Child Development Center subjects tended to be somewhat higher than for form constancy and figure ground. One group scored almost normally (9.9). The next highest average was 9.1. Four groups had averages in the 8's. Six had averages in the 7's and two had averages in the 6's. Form constancy had three in the 6's and figure ground had only 1. An examination of the perceptual relation means revealed much higher scores. As a matter of fact, two of the averages were in the 10's (10.0 and 10.1). A word of caution is necessary here though because this subtest is not given to children under five years of age, but rather they are given a score of ten automatically because normally this perception hasn't fully developed before the age of 5. The 1965 Child Development Center had contained only children under 5 years of age. On the other hand, the other group had quite a large number of children who were under five. The two Head Start groups consisted of children who were six years, or near six years of age. As may be seen from these figures, the means tended to be rather low; the highest mean was only 8.6. The lowest score, 7.4, was well above the low scores registered in the previous three perceptions (6.8, 6.2 and 6.5). In summary, one might note that except for the two aforementioned scores in the 10's, all scores for all perceptions for the culturally deprived in Silver City area fell below norm.

NON-CULTURE GROUPS

Indians. The means for culturally deprived Indians present a picture which is considerably different from the culturally deprived in Silver City. Thus, only one group, the 1968 Paraje, had a mean under ten (eye motor coordination). This mean was 9.6. The children at Jeddito had a mean of 11.6 in this perception. The average mean for figure ground was somewhat lower with 4 of 7 children scoring under 10. However, only one of these is actually low, and that is the Crownpoint preschool (8.1). An explanation of this finding here might be in order. The Crownpoint children were tested the second day after they had arrived. Many of these children had had little contact with society and/or strangers. Two of the children were mixed, one was Kiowa and the other was Laguna. The two children demonstrated a fact that few people recognize, namely the vast differences in languages from tribe to tribe. These two children had little understanding of Navajo and our adult translator had even less knowledge of Kiowa and Laguna languages.

The form constancy averages began to indicate the trend noted in all rural areas. That is, rural children all have difficulty with form constancy. In this perception one found a low of 7.6 at Jeddito which was the most isolated group tested. The other two scores in the 8's were attained by schools which were not quite as romote. Only two scores out of seven were above ten. There was only one score about ten (Position in Space), and although most of the groups (4) scored in the 9's, two of the groups out of seven scored in the 8's. The last category, spatial relations, was normal, or near normal for most groups. One may note that Crownpoint preschool children had an average of 10.0 and it included all children under 5 years of age.

Scores obtained by Mexican Nationals trended toward the same pattern as found with Indian children except that form constancy was somewhat lower. Except for this latter perception, the columbus children ranked normally or above normal. In summary, the non-culture groups scored higher than the culturally deprived groups in all areas. The one perception which gave the most difficulty was form constancy.

Non-Culture Subtest Averages. A comparison of the Laguna, Navajo and Mexican Nationals group showed that Mexican Nationals were below the norm on eye motor coordination. The Navajo culturally deprived were above the norm and Paraje were slightly above the norm in figure ground whereas Mexican Nationals and Lagunas were below (9.6). All groups scored low in form constancy but Mexican Nationals were considerably lower at (8.4). The perception of position in space was below normal for all three groups, but rather constant at (9.3). Navajo children ranked normally on spatial relations whereas Lagunas were down half a point and Mexican Nationals were down almost a point (9.1). The Crownpoint control group was well above normal in eye motor coordination and spatial relations. It was low in figure ground and position in space (9.8 and 9.2 respectively) and extremely low in form constancy (7.6). Except for form constancy the Crownpoint control children were higher in all perceptions.

NON- NDIAN-MEXICAN CONTROL

The nine classrooms at the Teacher Education Center included three each of the nursery, kindergarten and first grade rooms. The averages for these classes indicated that nursery children scored much lower in eye motor coordination than did kindergarten and first grade. All three of the nursery rooms had scores under nine while four of six kindergarten and first grade rooms had averages of ten or more. The nursery children's scores were also lower in figure ground, two of the averages being in the 7's, and the other being (8.2). Only one of six in the kindergarten and first grade rooms was in the 8's while three were above ten. A different pattern evolved for form constancy. It was the kindergartens that scored low in this perception. None of the groups had an average in the 10's which indicated that Teacher Education Center children also displayed difficulty with form constancy. Two of the kindergarten scores were in the 8's and another was in the 7's whereas the nurseries and first grade rooms all had means in the 9's. Teacher Education Center children ranked rather normally on position in space. Four of the averages were in the 9's as compared with four in the 10's and one which was 11.0. The means on spatial relations could not be used for nurseries because most of those children were under five years of age. However, the kindergarten and first grade children were well above the norm. Three of the means on spatial relations were in the 11's, two were in the 10's and only one fell below ten (9.6).

The Deming and Silver City Public School first grade children had averages which were comparable to the Teacher Education Center first grades in eye motor coordination and were only slightly lower on figure ground. The means were significantly lower than the Teacher Education Center in form constancy. One (Martin) was in the 7's and the other two were in the 8's as compared with all 9's for the Teacher Education Center children. The averages were slightly lower in position in space and were practically the same in spatial relations.

A comparison of the kindergartens at St. Mary's with the Teacher Education Center indicated that both groups were comparable in eye motor coordination and form constancy. St. Mary's children scored slightly above the Teacher Education Center in the other three perceptions. As a matter of fact, the averages made by St. Mary's children were all well above norm in figure ground, position in space and spatial relations. One explanation for St. Mary's higher scores might be that all the kindergarten children at the Teacher Education Center had been tested earlier in the program (November and January) whereas St. Mary's children were tested at the conclusion of their program (May). Post test scores for Teacher Education Center children could not be used for comparison because these children had received the Frostig developmental training before the May testing.

GROUP COMPARISONS ON SUBTEST MEANS

The various groups were combined to give means for different populations in accordance with the pattern displayed in Chart 1. The averages which were obtained from these overall group comparisons are presented in Table 4.

Silver City Culturally Deprived Children. The combined averages for Child Development Center programs arranged by year showed students improved year by year in the first two perceptions (eye motor coordination and figure ground). The averages remained rather constant for the last two perceptions (position in space and spatial relations) but decreased in form constancy. A combination of all Child Development Center scores revealed that these children were about mid-way between the 1965 Head Start and the 1967 Head Start programs in eye motor coordination and figure ground. The Child Development Center children scored higher on the other three perceptions. The totals also revealed that the lowest average (7.3) was obtained in figure ground and the highest (9.6) in spatial relations. The 1965 Head Start group also scored lowest in figure ground, but the 1967 Head Start had the lowest score (7.2) in form constancy.

The combined averages of culturally deprived in the Silver City area tended to stabilize the figures for each subtest. Thus eye motor coordination was around eight (8.3). Spatial relations was almost nine (8.8) while the other three were 7.5 and 8.

A combination of the Navajo culturally deprived showed that the group was normal in figure ground and spatial relations. It was above in the eye motor coordination (10.7) and was low in the other two. The combined figures on Lagunas showed that they scored .5 lower than Navajos on figure ground, spatial relations and eye motor coordination. They were approximately equal on the other two perceptions. The combination of these two populations when compared with the Silver City culturally deprived averages showed that Indians had much higher scores in all areas. The greatest difference was in figure ground in which the Indian score was (2.3) above the Silver City culturally deprived. The Indians also scored 2.2 above the Silver City group in eye motor coordination (10.5 to 8.3). The smallest difference was in spatial relations (9.4 to 8.8).

COMBINED MEANS FOR NON-CULTURE GROUPS

The Crownpoint control group was combined with the other Indian groups and the Mexican Nationals were combined in order to receive averages for these two subgroups.

Mexican Nationals had lower scores in all perceptions except position in space where the average was remarkably similar. As a matter of fact, the two differed by only .001. Mexican Nationals, however, scored higher than Silver City culturally deprived groups on all perceptions. The difference was not always great, being most evident for figure ground in which the Mexican Nationals scored at 2.1 higher. The least difference (.3) was in spatial relations. The averages of non-culture groups, when compared with culturally deprived, showed that the non-cultural were slightly above normal in eye motor coordination and slightly below in figure ground and spatial relations. As has been found in other rural groups, the non-culture group scored lowest in form constancy. As has been remarked previously the influence of culture is seen in position in space averages since it was .8 below the norm. The combined non-culture category had higher averages than culturally deprived groups in all subtests. The greatest difference was in figure ground (9.8 to 8.5) and the least difference was found in form constancy (8.8 to 8.3).

Control Groups Combined Means. Combined means were obtained on the three nurseries, the three kindergartens and the three first grades at the Teacher Education Center and these were combined into an average of Teacher Education Center children. The combined means revealed little more than was found from the previous investigation of the individual classrooms.

The combined averages of all Teacher Education Center children revealed that they scored above the norm in position in space and spatial relations and were half a point low in eye motor coordination. This group also scored a point or more lower in figure ground and form constancy. When the first grades at Teacher Education Center were compared with Deming and Silver City first grades, it was found that they scored in the middle on eye motor coordination, figure ground, and spatial relations. They scored highest on the other two perceptions. The Silver City public school first graders scored above the norm in all perceptions except form constancy. St. Mary's kindergarten revealed that St. Mary's children, who were well above 10.0 in all perceptions except form constancy, scored higher than the Teacher Education Center Kindergarten in all perceptions.

The total combination of control groups revealed that the means for all perceptions except form constancy were very near normal although figure ground was slightly low at (9.7). Form constancy was very low, the average score here being only (8.7). It might be mentioned that this comparison with the standard group revealed the biggest difference between rural and urban children. This author is of the opinion that urban children more frequently encounter more exactly shaped figures such as squares and circles. He also feels that urban children have experience with their properties at a very early age. They, therefore, are more able to discern the difference between such shapes as a square and a rectangle or quadrilateral. In conversations held with Indian social workers, he has learned that Navajo children are told that certain shapes are to be avoided when they are still quite young. The square might be one of these shapes.

Control versus non-culture. A comparison of control groups with culturally deprived and non-culture children revealed that non-culture children scored higher on the first three perceptions (eye motor, figure ground, and form constancy), but the difference was only (.1) on the latter two. Control groups scored a little higher in spatial relations, but scored significantly higher in position in space (10.1 to 9.2). This author feels that the reason is that position in space is related to the conceptual understanding of a child. To adequately perceive position in space, he needs to know such things as the meaning of in front of, behind, over, under, between, etc. These concepts depend largely on the child's communication ability, and since the non-culture groups are those who speak other languages, it is safe to assume that the lower score here is influenced by their lack of communication.

Control versus culturally deprived. The control group had averages which ranged from (.4) to (1.7) above the culturally deprived group in all perceptions. The least difference was found in position in space. The fact that position in space has a culture relation,as noted in the previous comparison, is further indicated by this finding. The children in the culturally deprived group consisted of Indian and approximately 95 percent of the non-Indian children had Spanish surnames. Their difficulty with English is strongly suggested by this finding. The averages for figure ground and spatial relations were also considerably lower (1.2) for culturally deprived children, which finding indicated that culturally deprived children have more difficulty than simply the communications (language) handicap. The lowest score (8.4) was found in form constancy. However, it has been pointed out previously that this low score is probably more the result of living in a rural area than it is being the result of cultural deprivation. The fact that control groups were low here probably explains why the median of all control groups was lower than fifty percentile (see discussions of medians).

HANDICAP LEVELS OF PERCEPTIONS VS CULTURAL DEPRIVATION

Handicap level of performance. The real value of the Frostig Visual Perceptions Test has been shown to be in the realm of diagnostics. Thus, the important point is not the total score or percentile made by a child, but rather the performance displayed by him on any one of the five subtests designed to measure his perceptions in that special category. Therefore, the comparison of total test scores may not be as revealing as comparison of scores in each of the subtests. Even in this regard this researcher feels that the mean score is not as meaningful as an examination of the number of children who ranked below 9 as compared with those who scored 9 or better on each of the subtests. A sub-test score below 9 indicates that the child's perception in this category interfers with his normal learning process. His learning to read is particularly affected. For the purpose of this investigation, a device was developed which is simply a line with a number above and below it. The number of students who received a score of 9 or better is written above the line and the number of students who scored below 9 is written below the line. Although this device gives a highly simplified statistic for the research project, it was not considered to be as meaningful to people outside the project because the total number of students has to be taken into account in each circumstance. Therefore, these numbers have been converted to a percentile which is the percent of the group that had received a handicap level score. Table 5 presents the data for each of the subtests for the same groups and in the same order as are found in Chart 1. These figures are then combined into the larger population groups in the same pattern as shown in Chart 1. The results of these combinations are displayed in Table 6.

Table 5 indicates that the visual perceptions handicap varied widely from classroom to classroom. The eye motor coordination tended to be fairly stable for any one group yet varied from program to program. The highest percentile for deprived children came in Silver City and the lowest fell into the Navajo Indian groups while the Laguna group scored in between. This pattern was somewhat repeated in the figure ground category except that most of the group suffered from a higher incidence of handicap on this perception. Regarding form constancy, the incidence of handicap was much more stable throughout the groups, being of the order of two/thirds. The Laguna Indians at Paraje seemed to be an exception. The position in space perception had a distribution of handicaps somewhat similar to the figure ground, the Indian children again the lowest incidence of handicap. Position in space was also highly variable, but in general the Indian children had a much lower incidence of this perception handicap. A remarkable finding was the very low incidence of this spatial relations handicap among the Navajo Indians. Navajo Indians spend a good part of their lives designing and weaving Navajo rugs. Children, especially girls, spend much of their time watching their mothers weave these rugs, and at a very early age are allowed to try their own hand at weaving. This training undoubtedly affects the perception in spatial relations because the test is based upon a child's ability to reproduce a given drawing. This investigator is of the opinion that if Navajo girls' scores were compared with boys' scores on this subtest, the girls would score higher. He plans to perform such a comparison in the near future.

COMBINED DATA

The first level of combination revealed very little that was not evident from an examination of the data on individual classrooms. Indian children had a lower incidence of visual perceptions difficulty in eye motor coordination, position in space and spatial relations, particularly and significantly lower in the other two perceptions. A comparison of the culturally deprived children at Silver City showed that the Head Start children of 1967 were somewhat lower in eye motor coordination and although incidence ran 20% higher for figure ground it was still on the order of 20 percentile points lower than other groups in that perception.

On the other hand Child Development Center children had almost 15 percentile points lower incidence of a handicap in position in space. The spatial relations figure for Child Development Center children was more than 40 percentile points lower than other groups. These data are not really comparable because the Child Development Center program included children less than five years of age. Children under five are not tested on this perception, but rather are given an automatic scaled score of ten. The overall figures for Silver City culturally deprived indicated that figure ground was the most difficult perception of the five. Four children out of five had difficulty with this perception. The form constancy and position in space gave trouble to approximately seven children out of ten. The only perception which had less than 50% scoring in the handicap category was spatial relations. The reason for this has been mentioned already; i.e., children who are under five years of age are given the normal score automatically.

NON CULTURE GROUPS

Mexican Nationals. The pattern which was previously indicated for Mexican Nationals in Columbus (see page 11) was quite evident when examining the handicap level of performance. Thus, the Palomas children had an incidence which varied from two times to four times as great (eye motor coordination and figure ground) in three of the perceptions and a somewhat higher incidence in form constancy while spatial relations remained the same. It must be remembered that the children in Palomas included some who were under five years of age.

In general the incidence of handicaps in all the perceptions was lower than found among the culturally deprived. The average for Mexican Nationals seems to have an incidence of handicap that is quite similar in pattern to the incidence of Laguna and Navajo culturally deprived children. The reader may remember that the Indian children had a much higher median score than Mexican Nationals (42 to 30).

The explanation is the same. An inconsistency here is probably that Indian children who scored above the handicap level had very high scores which offset the low ranking scores. On the other hand, the Mexican Nationals, although not having any higher incidence of handicap, had a larger number of children who were near the norm.

Indians. The Indian group contains the two combined scores from the culturally deprived group which has been discussed already, plus a third set of scores for the control group (Crownpoint Control). In general, the total control group had a very much better performance than the total of all culturally deprived. The control group also did better than experimental Indians in eye motor coordination, figure ground, and spatial relations. Scores were approximately the same in position in space, but were much lower in form constancy. The incidence of low ranking control students was slightly lower than for all culturally deprived children (71 to 75). The Mexican Nationals had handicap rates somewhat similar to the combined Indian children. The one exception was in eye motor coordination where the incidence of handicap was twice as great.

NON-INDIAN-MEXICAN CONTROL GROUPS

Teacher Education Center. Nine groups were tested at the Teacher Education Center. These included the nurseries, the kindergartens, and the first grades for the three years from 1965 through 1968. The tendency shown in culturally deprived groups for wide variation from classroom to classroom and from program to program was evident here also. Thus on eye motor coordination, the percent of children in the handicap category varied from 8 for 1966-1967 kindergarten to 62 for the 1965 nursery. The figure ground variation encompassed 17 to 92%. In form constancy the percent varied from 17 to 54. In position in space, the variation ranged from 0 to 33% and the least variation was found on position in space with the groups ranking from 0% low scores to 20% low scores. When all nurseries, all kindergartens, and all first grades were combined, the variation still tended to be great for eye motor coordination (17 to 41) and figure ground (21 to 81). Form constancy and position in space had a range of 11 and 12% respectively and spatial relations again had the least with a range of only 4, from 5% to 9%.

Silver City Schools. First grade children in the Silver City public schools tended to score very similarly to their counterpart at the Teacher Education Center. The two classes at St. Mary's Inter-Parochial School children showed a rather close similarity. Figure ground was the one exception. The total of these groups was almost the same as the Teacher Education Center Kindergarten groups. The Teacher Education Center Kindergarten children experienced a 2 to 1 higher incidence of handicap in figure ground as compared with St. Mary's.

Deming Schools. The two schools in Deming had rates of handicap which were similar to the first grades in Silver City public schools and Teacher Education Center on the first three perceptions. However, the Deming schools tended to run significantly higher on position in space and spatial relations. When combined with the Silver City schools the rates on these last two perceptions were a little less than 2 to 1 over the average first grade. The comparison of all first grades in Silver City and Deming with all Navajo of first grades (Crownpoint Experimental and Control) showed the incidence of handicap was similar for eye motor coordination, figure ground, and spatial relations. Handicap in form constancy was half again as great for Indians (67 to 41) and was 3 times as great for position in space (42 to 14).

Combined groups. The comparison of all control groups in the Silver City-Deming area with the one Navajo control group, revealed that Navajo children suffered a rate of incidence of approximately 2 to 1 in form constancy (75 to 41) and position in space(33 to 14), but was only half as great in figure ground (17 to 35). It is noteworthy that none of the Indian control group suffered from eye motor coordination handicap while the rate was 20% among Silver City and Deming control. Spatial relations was rather constant for both groups (Indians 4, Silver City 7).

A comparison of nurseries, kindergartens, and first grades revealed that the incidence of eye motor coordination handicap was almost 3 to 1 among nursery children although rather constant among the other 2 groups. Figure ground perception seemed to be highly responsive to age. 4 to 5 children in nursery had trouble here which is over twice as great as for kindergartens where 3 out of 10 experienced difficulty. The kindergarten rate was half again as large as the first grade. Form constancy, which was a problem for all groups, tended to remain rather stable at about 40%. Position in space had a percent of failing, almost twice as large for nursery children when compared with kindergarten and first grade. Spatial relations had a low incidence in all three groups, although the first grade was almost twice that of nursery (9 to 5). The influence of scores for children under 5 years of age was again indicated here.

The combination of Silver City-Deming control and Crownpoint control gave data on all control groups. In summary in the control group approximately 1 out of 6 children suffered from a handicap in eye motor coordination. The rate was twice as large as for figure ground (1 out of 6) and dropped to only 1/3 for spatial relations (1 out of 17). There were 250 children in the control group.

CONTROL GROUPS VS EXPERIMENTAL

Comparison of schools among the larger of the control groups tended to be rather stable, with only a few exceptions. On the other hand, a comparison of the control group with the culturally deprived group revealed vast differences. The handicap rate among culturally deprived children was over three times as great in eye motor coordination (57 to 18). It was over two times as great in figure ground (79 to 34). It was almost two times as great in form constancy (71 to 44). It was four times as great in position in space (65 to 16), and almost 8 times as great in spatial relations (46 to 6). These findings go far toward answering one of the main questions of the study; i.e. there is a strong negative relationship between cultural deprivation and visual perceptions. There were 169 children in the culturally deprived group.

One further comparison, control versus non-culture might be made. According to this comparison there were no great differences between the groups in eye motor coordination, figure ground and form constancy. However, the rate for non-culture groups was about 2 to 1 in position in space (34 to 16) and 3 to 1 in spatial relations (19 to 6). Since the rate for culturally deprived vs control was 4 and 8 to 1 on these respective perceptions one may conclude that non-culture may have some influence with regard to position in space and spatial relations. The fact that the non-culture group included experimental and control groups lead the investigator to examine the case of Crownpoint control. This side study disclosed that the incidence of handicap for position in space was about the same as for all non-culture, but spatial relations actually had a lower incidence than the control groups. All culturally deprived Navajo combined had an incidence about the same as for control groups, while Lagunas had an incidence the same as all non-culture. Therefore, one must conclude that the comparison is not valid for cultural aspects, but rather indicated the influence of Navajo children's perception of spatial relations.

Summary. In summary, one might say that Navajo children have about the same incidence of spatial relations perception handicap as the normal population whereas Laguna Pueblo Indians and Mexican Nationals have a definite culture-related handicap. In addition, this problem is further aggravated (almost doubled) because of cultural deprivation.

Position in space is probably influenced by one's culture. Since position in space depends in large upon a child's conceptual understanding. A child who has been culturally deprived, or who belongs to another culture, may well have problems of adequately perceiving in this category. This study indicated that the influence of difficulty with position in space perception, and cultural deprivation resulted in an additional doubling. The incidence of difficulty with this perception,however, tended to be rather stable among the various non-culture groups. The non-culture group contained 198 children although 71 of these children were included in the culturally deprived group.

CORRELATIONS OF FROSTIG AND LEE CLARK

COMPARISON OF CULTURALLY DEPRIVED GROUPS

1967 Summer Head Start. The main question in this phase of the project was whether or not a correlation existed between the Frostig test and reading readiness. A number of tests were examined with the result that the Lee Clark was chosen because it seemed to contain items which could be answered by a child adequately and which did not depend in any large measure upon culture factors or mental ability. Fifteen classes were tested in order to determine correlations under a variety of conditions. For example, four classrooms of the 1967 summer Head Start program had been given the Frostig developmental training, but such training had lasted only three weeks. In order to evaluate the results of the various developmental activities, each of the four classrooms had been asked to put major emphasis on one perception. This procedure allowed the teachers to have immediate access to developmental materials since this procedure would cut down on competition. The teachers made their own selection, therefore,it was not possible to determine which classrooms received the major emphasis in any category*. All classrooms received approximately the same amount of training. One classroom (Lopez) had been given permission to use other readiness materials. A comparison of these classrooms revealed that a fairly strong correlation existed between the two tests. The lowest correlation (.55) was found in the room taught by Lopez. This overall correlation is approximately the same as Dr. Frostig had computed between readiness tests and Frostig. She had a derived correlation of .56. The combined correlation (.64) was therefore higher for this group.

Child Development Center. The Child Development Center children were tested under two sets of conditions. The two rooms of the 1966-1967 program consisted of children who had been in Child Development Center training for a little over a year, and these children had had Frostig and post training at a very leisurely rate for approximately three months. The two classrooms in the 1967-1968 program contained children who had been in the program for two years and were given Frostig for perceptual training on a much better organized basis. All children tested were to enter the first grade at the beginning of the fall term. The hypothesis here was that the Child Development Center correlation would be lower than Head Start for the first year's program because the children had had so many other experiences which were likewise aimed at improving their reading readiness ability. It was further hypothesized that the correlation for Child Development Center's second year would closely approximate the first because the added effectiveness gained through a well organized Frostig developmental training program would be offset by the fact that children had had an additional year of Child Development Center training. An examination of the correlations verified the first aspect of the hypothesis since the correlations were down in the first year's program to .55 as compared to .64 for Head Start. The second aspect of the hypothesis, however, was not affirmed because the correlation for the second year program was even lower than the first year (.49). This finding indicated that Child Development Center training had a much higher influence on a child's reading readiness than was suspected. The combined correlation on these two groups (.58) was only slightly above that found by Frostig.

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* A conversation with Mr. Sandoval revealed that he had presented materials on form constancy and position in space.

One other classroom of Child Development children was tested. This was the Crownpoint experimental, a group of Navajo children who had been in a culturally deprived program the previous year. Although they were in the first grade, they had not yet started a reading program. The teacher had been concentrating on improving their English vocabulary. The correlation for this group was quite low (.38). When combined with the other culturally deprived group, a correlation of .56 was obtained for all children in the experimental group. It is noteworthy that this correlation was exactly the same as the correlation derived by Frostig in her research. This correlation was considered to be a healthy one. It was sufficiently high to indicate there is a relationship between the visual perceptions measured and the measure of a child's reading readiness.

PHASE II

A STUDY OF THE EFFECTIVENESS OF VARIOUS PROGRAMS

A second question of major importance to this project was regarding the effectiveness of various types of programs. Some investigation of this problem had been made prior to the beginning of the period covered by the Office of Economic Opportunity Grant. For example, the 1965 kindergarten at the Teacher Education Center was pre-tested and again post-tested six months later. Although the number of subjects tested was not large, this side study yielded information on effectiveness of the kindergarten program. The first grade at the Teacher Education Center was likewise pre-tested in 1965, and post-tested following intensive Frostig developmental program. The influence of such training was followed up by a comparison of the 1965 first grade and the 1966 first grade in their general behavior in learning how to read.

Although a pre-test was not given to nursery children at the Teacher Education Center year by year tests were compared with children of the same age group in the Child Development Center. The comparison of pre-test in the Child Development Center and the Teacher Education Center children of the same age has been discussed already in both this report and various WRI T-L Bulletins. The Child Development Center program began as a nursery program adjusted to the apparent needs of culturally deprived children in the Silver City area. The effect of such a program on a child's visual perceptions was investigated beginning early in 1966. The 1966 investigation was extended during the present research project by noting the child's performance on various tests according to the time he has been in the culturally deprived program and/or others.

During the present grant period a follow-up study of 1965 Head Start children was made. The effect of the 1967 summer Head Start program was assessed. Previous effectiveness was not sufficiently great so as to insure a child's overcoming his visual perceptions handicap. The 1967 summer Head Start, therefore, was utilized mainly to determine the effect of a short visual perceptions developmental training period.

The 1966-1967 kindergarten group at the Teacher Education Center was the first group to receive the Frostig developmental training. The number of subjects was small (9). Therefore the findings were combined with the 1967-1968 kindergarten. The combined averages on 1966-1967 kindergartens gave data for the effectiveness of such training with control groups. The Child Development Center children in the 1966-1967 program were given Frostig developmental training and this program was repeated for the 1967-1968 Child Development Center children. The early kindergarten training program at the Teacher Education Center (1966-1967) had shown that a chill might not overcome a perceptual handicap if it were extremely serious. Therefore, the first grade at the Teacher Education Center which contained mostly children from the previous year's kindergarten was pre-tested in the fall of 1967 and given two months' training and post-tested*. When the repeaters from this group were combined with second year Child Development Center children, the results yielded the effect of a second training program. By comparing the first pre-test and the last post-test, the overall gain or loss in each perception was determined.

The last analysis consisted of a comparison of post-test scores from the first training period and the pre-test score given before the second training period. An interim period of approximately six months, had passed so the analysis gave an indication of the persistency of the gain registered following the first training period. This persistency was further investigated for both Child Development Center children and children in the 1967 summer Head Start and the 1966-1967 Child Development Center program.

A few children (9) were encountered who had been enrolled in both the 1966-1967 and the 1967-1968 programs at Paraje. A comparison of this group, although not highly significant, gave some sort of indication of the effect of an Indian program for the culturally deprived programs. Since the number of children in the Crownpoint experimental (11) was so small, the significance of such a comparison was not great.

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* The training differed from the 1965 first grade training in that it was individualized according to the needs of each child. The 1965 training consisted of an intensive program given to all students.

A combined comparison is impossible because the statistics obtained on these two groups were not compatible; that is, the data on Lagunas concerned children who had repeated whereas the Navajo's data concerned the averages of two separate groups. The data concerning the investigation of these various programs are presented in Tables 7,8,9, and 10.

The null hypothesis was assumed for investigation of the effectiveness of various programs. That is, it was assumed that the various types of programs would have no effect upon the visual perceptions of the children. Therefore, if one were to compare the means secured before and after the program under investigation, it was hypothesized that no differences in means would be obtained. A T-test score was calculated for each of these comparisons and from this T score, the investigators determined the significance of the difference between the means. Significance was calculated on the basis of greater than 20 percent, less than 20 percent, less than 10 percent, less than 5 percent, less than 2 percent, less than 1 percent and less than .1 percent. Any significance over 10 percent level was not considered significant. A level less than 2 percent was considered to be highly significant.

HEAD START PROGRAM

The 1965 Head Start group consisted of two rooms and twenty-eight children had been tested in this program. A post-test was given to sixteen of the children in September of 1967 with the following results. Mean subtest averages were higher in all perceptions although the only perception which was above normal was in eye motor coordination (10.2). The smallest gain was registered in form constancy and since children were three points low on this previously, the result was that the average was still extremely low (7.3). Averages had been extremely low likewise in figure ground and position in space, but since gains of only two points were made on these perceptions, the final average was only about one point low. Less gain was made in spatial relations, but since the pre-test score had been a whole point higher, the end result was an average similar to the average for figure ground and position in space. Significance was established at the 2 percent or less than 2 percent level for three of the perceptions. The only perception without significance was form constancy. Figure ground was at the 5 percent level.

KINDERGARTEN TRAINING

1965-1966 Teacher Education Center Kindergarten. The 1965 kindergarten children were tested in November, 1965 and again six months later in May 1966. A comparison of subtest means failed to indicate any great gains in eye motor coordination. The other four perceptions exhibited large gains varying from 1.6 to 3.0. The only gain which had significance was position in space which was less than 10 percent. The low significance was due to the fact that only ten subjects were involved.

1967-1968 Kindergarten at St. Mary's Inter-Parochial School. It has been previously indicated that the children at St. Mary's Inter-Parochial School had very high scores. As a matter of fact, the kindergartens had scored from above normal to well above normal in all perceptions except form constancy. Since these children were tested in May, whereas the Teacher Education Center children were tested in November, six months previously, some sort of comparison might be made in order to indicate the effect of a kindergarten program on the perceptions of children at that age level. Such a comparison showed that the children at St. Mary's kindergarten had not scored any gain over the 1965 Teacher Education Center kindergarten in eye motor coordination. The other averages showed that the difference in figure ground was slightly less than what had been achieved in the 1965 Teacher Education Center program but was somewhat greater in the form constancy. The gain in figure ground was considerably less than Teacher Education Center and was approximately the same in spatial relations. Thus it may be said that the effectiveness of the kindergarten training in imporving a child's perception is indicated and probably is fairly constant from kindergarten to kindergarten.

PRE-FIRST PROGRAM

The Mexican National children who were attending school at Columbus were given a program similar to that offered for many years in New Mexico which is entitled pre-first. It has as its objective the teaching of English vocabulary to children who speak Spanish primarily. The effect of this program could be roughly evaluated by comparing the results made by children of the same age who attended school in Palomas, Mexico. The children in the Columbus school also lived in Palomas, Mexico. A comparison of these two groups has been made already (see discussion on medians and subtest mean averages, Phase I). Summarizing the previous discussion, it was found that children in the Columbus Pre-first classroom scored .7 to 2.4 above children in Palomas on the various perceptions. Thus the value of the pre-first program in improving a child's visual perceptions was strongly indicated. Further study, however, would be necessary in order to establish the significance of such an improvement.

FIRST GRADE, SILVER CITY SCHOOLS

Although the comparison was not valid, some indication of the effect of the first grade program in the Silver City schools on visual perceptions were assessed by comparing a group of fifteen children tested in December of 1967 with nineteen children who were tested approximately May first of 1968. The comparison of the subtest averages showed that they were remarkably similar. As a matter of fact, the scores for the two groups were exactly the same on eye motor coordination, form constancy and spatial relations. They differed only on figure ground and position in space (.1 and .3 respectively). This finding indicated that very little change had occurred in children's perceptions over a period of six months. Of course, further investigation would be necessary to establish the validity of such a finding.

NURSERIES

The nursery children at the Teacher Education Center were given Frostig tests every year from 1965 through 1967-1968. These averages have been discussed in Phase I of the study. Therefore, no further analysis will be made in this section. In summary of the Phase I findings, it may be said that no significant change was indicated for the programs. However, further investigation would be necessary in order to establish the validity of this finding.

THE EFFECTIVENESS OF THE CHILD DEVELOPMENT CENTER PROGRAM

The effect of the adjusted nursery program was derived in two ways. First children were tested in April of 1966 and again in the fall of 1966 in order to evaluate the effect of the first program. The Child Development Center children were tested again in March of 1967 some eight months later. However, children had been in the program for almost seven months since the Child Development Center was in session all that time except August, 1966, the hypothesis was that a comparison of the two sets of statistics would reveal that gains made in the first program should be approximately one-half of the gain in the second program.

1965-1966 Child Development Program. The children in the 1965-1966 program which really began in March of 1966, were pretested shortly after the beginning of the program and were post-tested near the conclusion of the program in July of 1966. The children had been in the program therefore approximately three and one-half months. The fact that such training had on visual perceptions was apparently very, very small. Children had made their greatest gain in eye motor coordination (7.5 to 8.8). The children actually regressed in form constancy and spatial relations although the amount was almost insignificant. About one-half a point gain was made in figure ground and position in space. The significance was calculated for the differences in the means and it was found that the eye motor coordination had a significance to the level of .1 percent and figure ground under two percent. The other differences were not significant.

1966-1967 Child Development Center Program. No pre-test was given to the 1966-1967 Child Development Center group of children because most of them were repeats from the previous year and because the Frostig test had been given as a post-test shortly before the beginning of the program in September. A test, however, was given in March of 1967 before the beginning of Frostig developmental training. The children who were repeating the program,therefore, can be evaluated by using the March 1967 test as a post-test and the July, 1966 test as a pre-test. This span of time amounts to eight months and is just a little more than twice as long as covered in the 1965-66 program.

The resultant averages indicated that the greatest gain again in the second year's program was on the eye motor coordination perception. This gain (.7) was not as great as was made in the first year's program. Gain was also registered in figure ground (.6) which was .1 more than in the first year's program. The other three perceptions showed a lower score. It is interesting to note that the children lost almost exactly the same amount of ground in position in space as they had gained in the first year's program. The only one of these averages that had any significance was the .9 loss in form constancy and this significance was not of a high level (10%). The problem that presented itself to this investigator was that perhaps children who had entered the program following the first year were lending undue effect. Therefore, an additional investigation was made by analyzing the children who had been in the program both years. This analysis consisted of comparing the averages made on their first test (April of 1966) with the test made in March of the following year. Not only did this give the result of almost a year's Child Development Center training (the children had been out of school during August, 1966), but also it did serve to compare the results of the children who had been in the first year's program. The side investigation did not reveal any great change in the conclusions. As had been indicated in the 1966-1967 program, the first two perceptions advanced while the other three showed a decline. The decline in spatial relations was .3 as compared with less than .1 in 1966-1967. The significance of these differences was greatly enhanced because of the comparison although the number of scores was approximately the same. Position in space and spatial relations had no significance. Form constancy was at the ten percent level. Figure ground was less than two percent and eye motor coordination was .1 percent level.

The conclusion that these figures lead to is that the Child Development Center program in general had little effect on the children's visual perceptions. The one exception to this is in eye motor coordination where the effect was beneficial. There may be some beneficial effects in figure ground. Since the children scored lower, one might conclude that the Child Development Center program had an adverse effect on visual perceptions with regard to form constancy, position in space, and spatial relations.

INDIAN PRE-SCHOOL PROGRAM

Nine children at the Laguna school of Paraje were found to have repeat from the 1966-1967 to the 1968 program. The children in the 1966-1967 program were tested in June of 1967. Therefore, more than six months had elapsed between the first program and the second. A comparison of the subtest results for these nine children gave some indication on the effectiveness of an Indian preschool pregram in changing a child's perceptions. An examination of the results showed that the children fell somewhat in eye motor coordination and were considerably lower (1.2) in form constancy. They made gains ranging from .4 in figure ground to 1.8 and 1.6 respectively in position in space and spatial relations. The gain in position in space was at the ten percent level, but there was no significance in the differences of the other four perceptions. Thus it may be said that although some benefit was indicated for the Paraje school program, the significance of such change cannot be demonstrated.

SUMMARY

Summarizing the effects of the various programs investigated so far, it may be said that some gains were demonstrated or at least indicated by each program. Effectiveness of the Teacher Education Center kindergarten was demonstrated and St. Mary's kindergarten was indicated. Pre-first programs were indicated to have some beneficial effect, but public school first grade had no indicated effect. Nurseries and adjusted nurseries,although indicating some beneficial effect, were not significant. The strongest finding was regarding the effect on certain perceptions displayed by the adjusted nurseries program. Approximately the same finding was made for the Indian preschool program.

CULTURALLY DEPRIVED PROGRAMS

Effect of Frostig Developmental Training. The research indicated early that Frostig developmental training would have a profound effect on a child's visual perceptions. Thus, in 1965-1966 the first grade at the Teacher Education Center had been given intensive developmental training for a period of two months. The effect was that the visual perceptions percentile median rank was raised from a low sixty percentile to well above the eighty. However, as previously stated, the children in this group failed to learn how to read any better than the 1966-1967 first grade who had only occasional developmental activities. Subsequently, the research decided to concentrate effort on diagnosing visual perception handicaps and concentrating training at the weak spots. The 1966-1967 kindergarten were given a pre-test in January 1967 and children were then presented activities which were peculiarly adapted to their perceptual level.

Gains were made, as may be seen from Table 8, but since the number (9) was so small, the significance could not be established at any higher level than ten percent (figure ground, position in space and spatial relations).

A similar type program was given to the Child Development Center children in the spring and summer of 1967 as well as the winter of 1967-1968. In addition, the 1967 Head Start children were given a short (three weeks) program of developmental activity. The first grade at the Teacher Education Center, as well as the kindergarten, were given the program during the winter of 1967-1968. The results of this testing are also presented in Table 8 .

The data indicated that Child Development Center children tended to remain at the same level or regress in eye motor coordination and spatial relations whereas they made gains in the other three areas. These other areas varied from a low of .1 of one point (1967-1968, figure ground) to a high of 3.2 points (1967-1968, form constancy).

The significance of the gains for all Child Development Center children could not be established in the case of the eye motor coordination and spatial relations, but was at the one percent level in the other three categories.

The 1967 Head Start children benefitted more from the short training period than did the Children benefitted more from the short training period than did the Child Development Center children. Smallest gains were made in the eye motor coordination in chich little or no developmental acticities were given. Greatest gain was made in the position in space category, and significance was established at the .1 percent level for constancy, position in space and spatial relations. Figure ground had a significance level of two percent.

When data from Child Development Center and From Head Start children were combined, the greatest gain was found to be on position in space. Spatial relations had the least gain other than eye motor coordination. The gain varied from .9 in figure ground to 1.9 in position in space. The level of significance was greater than twenty percent (no significance) while the other three figures were significant at the one percent level.

Teacher Education Center classes. The training at the Teacher Education Center produced less effect. This fact probably is accounted for by the fact that socres on the pre-test are considerably higher than in the culturally deprived program. The lowest scaled score, form constancy is found in the 1966 kindergarten (8.2) whereas the lowest scaled score in Child Development Center is likewise the form constancy and has a figure 7.6. The Head Start program had the lowest score on position in space which was 7.1 although form constancy was only .1 of a point higher (7.2). Thus the lowest score of the kindergarten is almost one point higher than the lowest score of the culturally deprived children. Gains were made in all categories except the 1967-1968 form constancy which dropped from 9 to 8.8. However, due to the small number of children involved significance could never be established at a higher level than ten to twenty percent. Such figure is considered to be practically insignificant.

All children were combined to yield figures which were significant at the 0.1% level for figure ground, form constancy, and position in space, 1% level for spatial relations and less than 20% level for eye motor coordination. Gains were made in all categories by children although only a .1 of a point gain was made in the eye motor coordination perception.

EFFECT OF SECOND FROSTIG TRAINING

A small number of children (13) were found to have taken visual perceptions training the second time. The findings on these children revealed that they improved, vastly from this second training in the form constancy and position in space category although the significance is only established at the five percent level due to the fact that such a small number of subjects were involved. An interesting finding here is that although the pre-test score on form constancy is even higher than the post-test score for all culturally deprived, the post-test score after the second training advanced even further.

The Crownpoint Pre-school Group. The Crownpoint pre-school group had been given the Frostig test very soon after the beginning of the program (see discussion of Indian groups in Phase I). The group was then given Frostig's developmental training as well as the usual program for culturally deprived. The group was tested then in June of 1968 and the following findings were made. Positive gains were made in the first four visual perceptions. No difference was noted for the last one. The gain achieved varied from a low of .2 in eye motor coordination to 2.6 in form constancy. Since the lowest scores had been obtained on form constancy, the individualized training programs have the major emphasis on this perception. It is quite apparent from these averages that positive results have been achieved. There were only nine children involved in this comparison. Consequently it was hard to develop any high degrees of significance, but even with this small number of subjects, the gain made in both figure ground and form constancy was at a level unter ten percent.

THE EFFECT ON LOW SCORING STUDENTS

Previous investigations had shown that Frostig training given indiscriminately to everybody is of little value (see WRI T-L, Volume I, Issue 4, 1967). Therefore, throughout this investigation, the procedure was followed by which children were pre-tested and using the pre-test results diagnostically and an individualized program was presented the children with the aim of targeting in on their visual perceptions handicaps. Training was not given to children who did not need it nor was it given in areas where children did not need it. A child was considered to be visually handicapped in a single perception if his scaled score was below nine.

Therefore, in order to assess the effect of the individualized training scores made by children, subtest scores which fell below nine on the second pre-test (pre-test 2) were grouped and analyzed.

Since the number falling below nine tended to be small in certain categories, these data are not broken down into individual classrooms, but rather are presented for all Child Development Center children, all 1967 Head Start children, a combination of all culturally deprived children and for whatever it is worth, the Teacher Education Center children are combined with the latter group to yield data on all children. These data are presented in Table 10.

As might be expected, the data in table 10 are considerably different from table 8. The pre-test scores are quite low for all groups varying from a score of 6.2 on position in space for Head Start children to a high of 7.6 for Child Development Center children in eye-motor coordination. The post-test scores show that considerable gain was made throughout. The smallest gain (figure ground) was still almost one point (.9). The greatest gain was made in position in space with a 3.0 gain. These data also reveal a fact that had been somewhat indicated but never truly revealed, i.e. figure ground perception was the one which children responded to the least when given Frostig's developmental training. On the other hand, this fact was not evident when all children are examined together. In the latter circumstance, spatial relations had the same final score. When all children are combined, the data display a remarkable similarity. Except for position in space which had a post-test score of 9.5 while the other four clustered around 8.5.

Further comparisons. The students who had undergone a second Frostig training were examined by comparing their first pre-test score and their post-test score following the second training period. This analysis yields data on how much overall progress was made during both the first and second training periods. Referring to the statistics presented in Table 9, one finds that the students made gains in the first four visual perceptions but registered a half a point loss in spatial relations. As previously stated, the loss in spatial relations is probably due to the fact that as children grew older, their score was transferred from an awarded score of ten to a real score based on their actual performance. The gain in various perceptions varied from .7 for eye motor coordination to 2.8 in form constancy. Significance was established at the two percent level on the first two perceptions and five percent level on the last two. The loss registered in spatial relations had no significance (greater than ten percent). Students had a final average score which was well above the norm in all areas except eye motor coordination which was less than one-half a point from the norm. This fact indicates the value of a second training. It had been pointed out previously that little training was given in the eye motor classification, therefore, no advance was suspected. Since all students in rural areas tend to be weak on form constancy, it is gratifying to know that a second training period yielded the greatest benefit on this perception.

From the analysis of the students who had undergone a second training period, it may therefore be concluded that children do benefit although the signficance of such findings was not high. It may also be concluded that the level attained by the student from a training period tends to be stable over a period of approximately six months.

Persistence of gain (or loss) achieved. The persistence of change resulting from Frostig training was also investigated for the 1967 Head Start kindergarten group. This was accomplished by comparing the results of the May, 1968 post-test with the summer program (July, 1967). The summer program had included Frostig developmental training. This comparison showed that children registered a gain in four of the five perceptions. The only loss (.7) was registered on form constancy. Significance of the gain or loss could not be established for any of the groups (all lower than twenty percent level except for spatial relations). Here the significance was less than .1 of one percent level. Even if losses had been registered in all categories, the lack of significance would have been an important finding. To find that students had advanced was highly gratifying, since Frostig visual perceptions training had been presented for only a three-week period.

A study similar to the kindergarten was undertaken for Child Development Center children. The data for this investigation were obtained by again comparing July 1967 scores with May, 1968. Ten children in public schools were tested. A loss was registered in only one of the five perceptions whereas gains registering from 1.3 to 1.9 were registered in the other four. Significance, however, was indicated only on position in space with a level less than ten percent. The Head Start and Child Development Center scores were combined in order to obtain persistence information on a larger group. The calculated means again showed a loss in only one of the five perceptions. This loss was in form constancy while insignificant gains were made in eye motor coordination and figure ground. Good gains were registered in position in space and spatial relations (.9 and 1.1 respectively). The level of significance for the latter two was less than five percent for position in space and less than .1 percent for spatial relations.

A certain number of children were found to still be in the Child Development Center the following winter and therefore a comparison of their post test of the 1966-1967 program with their winter test (January, 1968) was made in order to determine any change which might have occurred in the visual perceptions of the children during the interim period. This comparison revealed a different pattern than was found for the children who had gone to public school. It was found that the last score was lower on three of the five perceptions. The lower scores were on form constancy, position in space and spatial relations. Gains were made in eye motor coordination and figure ground at a level of less than five percent.

In summary you can see that not only are gains made as a result of the Frostig visual perceptions developmental training, but these gains are either retained or significantly bettered during the subsequent nine months.

Conclusions. In conclusion it may be said that children made gains significant at the .1 percent level following a training program provided this training program was adjusted for individual needs of children. A second training program did not benefit all children significantly, but where children were involved who had scored extremely low, the second visual perceptions training was effective. Significance for such a program was established at less than one percent level on two perceptions (eye motor coordination and spatial relations) and less than .1 percent level on the other three. It was found further that the gains made by these children tended to persist or actually were bettered during the academic year following their training. Where losses in achievement were registered, they were not significant, but where gains had been made, significance of less than five percent was demonstrated.

When the Frostig training program findings were compared with the findings of other types of programs, it was found that although gain had been made by almost every program, significance for such a gain,or the persistence for such gains, could not be demonstrated.

PHASE III

COMPARISON OF THE FROSTIG TEST WITH OTHER TESTS

Dr. Frostig had undertaken the project which developed the visual perceptions test because these were perceptions which had to do with the children's learning to read. She had correlated the Frostig test with other tests and found that Frostig test scores only had a low correlation with tests of mental ability. The correlation was approximately .35. On the other hand, the test correlated rather well with reading readiness tests (.56). This author had searched for other tests of visual perceptions, but could find none that measured visual perceptions in as many categories as the Frostig. The reading readiness test, on the other hand, did seem to have some mutual areas of measurement. In addition, the Peabody Picture Vocabulary test, which had become recognized as the best over-all measuring instrument for evaluating progress in culturally deprived programs, also seemed to have a bearing because of the conceptual nature of position in space. The correlations calculated by Frostig by comparing IQ tests and the Frostig test had been conducted by tuilizing such tests as the Otis. Therefore, the use of the Goodenough-Harris for correlation on IQ seemed appropriate.

Correlations were obtained in this study on the following basis: Lee Clark and a Frostig test were given at the same time to the first grade groups consisting of Navajo children who had received training in a culturally deprived program, as well as those who had not received such training. The Lee Clark was given to Head Start children after they had received training, as well as to Child Development Center children. Both of these groups had had Frostig developmental training. The first grade at the Teacher Education Center consisting of approximately one-half who had had Frostig developmental training in kindergarten the previous spring was tested. Finally, the kindergarten at the Teacher Education Center was given the two tests before Frostig developmental training and after Frostig developmental training. These correlations are reported in Table 13.

COMPARISON OF CONTROL GROUPS

Two classrooms of first grade children at Crownpoint who had not been included in a culturally deprived program were also tested. The correlation of this group (.38) was exactly the same as it was for the experimental Indian children. This circumstance was rather remarkable and indicated that the culturally deprived program did not have any significant effect on the correlation. The correlation was low and was of about the same order as the correlation between the Frostig test and mental maturity tests as measured by Frostig.

Teacher Education Center Children. Children at the Teacher Education Center who were tested in this phase of the program included a kindergarten group before they had received any Frostig training and they were tested again after they had received Frostig training. One other group, the first grade at the Teacher Education Center, was tested at the beginning of the fall term, and this group included children who had had Frostig training the previous spring. The hypothesis was that the first grade group would have tended to lose some of the gains they had made as a result of their Frostig training, and at the same time would have acquired some additional experiences which might benefit their reading readiness score. The first grade group would have a correlation which would lie between the two kindergarten correlations. An examination of Table 13 revealed that this was not the case. The correlation of the first grade at .69 was actually the lowest of the three. The other two tended to remain rather constant. The first grade correlation therefore was slightly higher than was found for a combination of Head Start children. The correlations for the winter and spring kindergarten group showed that the children in this group had a higher correlation before taking Frostig training than they had after taking Frostig training, but the difference between the two was quite small.

A previous study of children who had received Frostig visual perceptions developmental training revealed that they had made progress as a result of their Frostig training (.53). The only exception was in form constancy. Therefore, since correlations had remained the same one much conclude that the children would have made comparable improvement in their Lee Clark scores. Means were computed in order to test this conclusion. It was found that the children had advanced from an average mean of 62.7 to 87.3 which is a span of almost 25 percent. This finding strongly suggests that the visual perceptions training had a pronounced influence on the child's reading readiness.

St. Mary's The last control group to be tested were the children at St. Mary's kindergarten. The correlations for these two groups were different which circumstance may be explained if children in the morning group tended to score higher than the afternoon, whereas the averages on the Frostig tests remained fairly constant. Average Lee Clark scores were therefore obtained. These showed that the morning group did in fact score higher than the afternoon group in the Lee Clark. However, the difference was only 2.2 percent (85.9 to 83.7). This finding suggested that the kindergarten program had had as much influence on reading readiness as did visual perceptions. The combined correlation for the two (.53) was almost the same as Frostig had found. The high mean scores at St. Mary's plus the high Lee Clark averages and a typical correlation would indicate that the St. Mary's kindergarten was highly effective in developing readiness. On the other hand, if it could be presumed that the offerings of the Teacher Education Center and St. Mary's kindergartens were approximately equal, the differences between Frostig would stem from the fact that St. Mary's children were tested later. The Teacher Education Center and the morning kindergarten at St. Mary's had Lee Clark means which were approximately the same. Therefore, the May 1968 Frostig of Teacher Education Center and Lee Clark must be similar. An examination of the Teacher Education Center Frostig scores made in May of 1968 was compared with St. Mary's (also tested in May). This comparison revealed that the two groups had average scores on the subtests which were remarkably similar. The variation was more than .3 in four of the tests and in position in space the kindergarten had a mean of 12.1, while St. Mary's was only 10.6. Since both of these scores were above normal one might apply the logic here that has been repeated often.

That is, a child who is above normal in visual perceptions is not really going to learn to read any better than one who scores at the norm. The total perceptual average for the group differed by less than two points and therefore the two were within four percentile points of each other.

Combined Correlations. St. Mary's kindergarten scores were combined with the first set of 1968 scores at Teacher Education Center to give a correlation for groups which had not received Frostig visual perceptions training. This correlation (.58) was just slightly above that obtained by Frostig in comparing reading readiness tests on her own test. All kindergartens combined had a correlation of the same order. All of the control classrooms in Silver City were combined and this correlation (.55) again is about the same as obtained by Frostig. It is noteworthy that the correlation compares likewise with all experimental children. The Crownpoint control score having been low therefore had the effect of dropping the correlation to .53 which is still quite close to the Frostig derived correlation and to the experimental group correlation.

Summary. One must conclude from this investigation that the correlation between the Frostig test and reading readiness as measured by the Lee Clark test is a fair correlation. This correlation was no different from that found among children in urban groups (Frostig used only urban populations). The correlation also remained constant whether visual perceptions training had been given or not. The fact that visual perceptions training obtained higher subtest scores therefore must result in higher reading readiness scores. The findings again emphasized that visual perceptions are not the only factors that influence a child's readiness for reading. The correlation between culturally deprived and non-culturally deprived groups was found to be the same. This fact, coupled with the fact that culturally deprived groups have lower average scores, as well as a higher incidence of handicap with regard to perceptions, leads one to conclude that lower perception scores will result in lower Lee Clark scores.

FROSTIG VERSUS METROPOLITAN READINESS TESTS

The 1965 summer Head Start program had been tested using the Metropolitan Readiness test. These two classrooms had also been given the Frostig visual perceptions test. The Metropolitan Readiness test does contain much activity similar to the Frostig test. Thus, one could not expect to derive a correlation as high as the Lee Clark. The two classrooms performed just abovt as one would expect (.38 for one and .40 for the other). The two correlations when combined came out to a .34 which is approximately the same as that derived by Frostig when she compares the Frostig test with tests of mental ability. The Metropolitan Readiness test was used at that time because it had been used at the Teacher Education Center for many years and therefore comparable data were available. However, the cultural related nature of the Metropolitan is so great that it was not used again. The Peabody Picture Vocabulary test was adopted in place of the Metropolitan. This test has aspects which might be termed achievement yet it is normally considered to be a test of mental ability. This correlation and those that follow are listed in Table 13.

FROSTIG VERSUS PEABODY AND OTHER TESTS

A sample of the 1966-1967 Child Development Center children was examined and correlations were derived for the subjects utilizing the Frostig visual perceptions test which had been administered approximately the same time. The 1966-1967 Child Development Center group were given the Peabody test by Dr. Reilley. The correlation obtained (.52) from these two groups showed that the relationship between the Peabody and visual perceptions, although being slightly lower than for reading readiness correlations, is still well above the derived correlation for tests of mental ability.

A correlation was obtained between the Goodenough-Harris and Frostig. The Goodenough-Harris was used here because it was felt that it was one test of mental ability which does not seem to depend upon vocabulary or cultural aspects. Also, this author thought it would be interesting to see if there was any relationship between Frostig and Goodenough-Harris due to the fact that eye motor coordination and spatial relations seem to be involved here. When a child draws a figure of a boy or girl, he needs to have some drawing ability (eye motor coordination) and he needs to have some ability to recall the details and to reproduce such details from his memory. Although somewhat far fetched, this investigator thought there might be a possibility that the child's drawing might show the influence of spatial relations perception since that perception covers the ability of a child to reporduce a given drawing. The correlation derived from this comparison (.24) failed to demonstrate that there is such a relationship. The correlation was considerably less than that derived by Frostig on mental abilities. This finding was rather important because it would indicate that visual perceptions are not related to mental abilities.

Frostig vs. Lorge-Thorndike. Fourteen children in the 1966-1967 first grade at the Teacher Education Center were given the Lorge-Thorndike Intelligence Test. When this test was correlated with the Frostig Visual Perceptions test, a correlation of .51 was derived which finding was closely similar to the combined Child Development Center correlation of .53.

Frostig vs. California Test of Mental Maturity. It had been hypothesized that the California test would have a correlation very similar to that received on the reading readiness because a number of items were included in that test which were similar to items found in the Frostig and in the Lee Clark Reading Readiness Test. Only ten subjects were involved and therefore, the correlation may simply be a matter of coincidence. The result showed that the hypothesis was not supported because the correlation .06 indicated that no relationship existed. More for the matter of curiosity than for actual investigation purposes the two Teacher Education Center mental ability tests were combined. The derived score (.49) was much more respectable.

Frostig vs. Vineland Mental Maturity Test. An additional group mental abilities test - the Vineland test of mental maturity - had been given to a sample of the 1965-1966 Child Development Center children. Fourteen subjects had been tested. The correlation received for this group (.31) was close to the Metropolitan correlation and slightly higher than the Goodenough-Harris. The difference between the Vineland and Goodenough-Harris might be explained from the standpoint that vocabulary is involved in the former. These test results were combined again with other tests of mental ability to yield a combined correlation of .44 for 38 subjects.

SUMMARY

One may conclude from these results that the Peabody Picture Vocabulary Test has a reasonable sized correlation. This correlation was somewhat lower than the correlation for Frostig vs. Lee Clark and was somewhat higher than the correlation derived from a comparison of Frostig with other group intelligence tests. The correlation derived on Goodenough-Harris tests was the lowest of all, which indicates practically no correlation. It was remarkably similar to that calculated by Sprague. In general, one may say that the correlations determined by this investigator were approximately the same as those derived by investigators of several other previous studies.

PHASE IV

A LONGITUDINAL STUDY OF A SELECTED SAMPLE OF SUBJECTS

The investigators were able to keep in touch with approximately fifteen children who had been in various programs for approximately eighteen months. Although some children had been followed up during a greater period of time (see discussion on 1965 Head Start program), this group was especially interesting because they had taken the Frostig at least five times. One youngster had a raw score on form constancy of -3 on her test in the kindergarten so this author administered that subtest every two or three months for almost a year in order to trace the development of this perception. The test scores made by the children in this group are presented in Table 15. As may be seen from examination of the table, four of the fifteen children had taken four tests. Actually two of these children who had taken five tests were identical twins, one of whom had not taken the first test, and the other of whom was not present for the last test. Therefore, their span encompassed as great a length of time as found in the group which included those with six test scores. The scores on these fifteen children were combined and tests of significance were calculated for the total. A separate examination was made for children who had taken the first test in April of 1966 and who had taken the last test in May of 1968. Four had taken the second test in July of 1966. In addition, if a child had taken the first test in April of 1966 and the next to the last test around the first of January, 1968, the record indicates that twenty-five children fitted into this group. In addition to these groups sixteen children of the twenty-eight in the 1965 Head Start program were given a follow-up test in September of 1967, covering a span of more than two years. Although a discussion of the 1967 Head Start was made in Phase II, the subtest averages will be presented again here.

The averages shown in **Table 14** indicated that the 1965 Head Start and the 1965-1966 Child Development Center children had approximately the same pre-test averages on eye motor coordination, but the post-test average for Head Start children was .8 above the other group. The combined Child Development Center and Teacher Education Center children who had taken tests at least eighteen months apart (twenty-five of them) had a higher pre-test score, but were considerably lower on the post-test score on eye motor coordination. The pattern for eye motor coordination was repeated somewhat. On figure ground, the Head Start children scored lower than the other two groups on the figure ground pre-test. In the post-test score the Head Start group ranked about midway between the other two. All three groups, however, made approximately the same amount of progress in both these subtests (1.9 on the first and 1.7 on the second). The differences among the group became apparent when examining form constancy. For example, the Head Start group ranked extremely low on the pre-test (7.0) whereas the small group of Child Development Center and Teacher Education Center children ranked above normal at 10.2, and the larger group was slightl below normal at 9.7. On the other hand, the Head Start group had made a slight advance (.3) on the post-test while the smaller of the Child Development Center-Teacher Education Center group had regressed considerably (- 1.3), and the larger Child Development Center-Teacher Education Center group was unchanged.

Head Start children scored very low in position in space on the pre-test, but the other two groups also had scored low on this perception. Although the gain for all groups was approximately the same (1.6), the Child Development Center-Teacher Education Center group had post-test averages above the norm. The Head Start Children were still almost one point low. The pattern was confused again for spatial relations with the smaller Child Development Center-Teacher Education Center group registering a decline of .75 while the larger group and the Head Start registered an advance of .8 and 1.2 respectively. The significance of the differences for the smaller Child Development Center-Teacher Education Center group was established at only less than ten percent on eye motor coordination. The larger group had a similar significance for that perception, no significance for form constance, less than five percent significance on position in space and spatial relations and less than one percent significance on figure ground. The Head Start group had no significance on form constancy, less than five percent significance on figure ground and two percent or less significance on the other three.

In summary one might say that a study of the groups over a period of eighteen months to more than two years indicated that the group made no gain or even loss in form constancy. The children made significant gains in eye motor coordination, figure ground, and position in space. The change registered by children in spatial relations could be demonstrated only for children in larger groups.

The second part of the longitudinal study concerned a number of students who had taken five or six tests. The test scores were averaged and each subtest was arranged by successively comparing 1 to 2, 1 to 3, 1 to 4, 1 to 5 and four children 1 to 6. Test scores and consequent significance also were calculated for each subtest average. These data are presented in Table 15.

The eye motor coordination showed a gradual post-test improvement up to the third test and then it dropped off, but the overall gain on the five tests was one point higher than it had been in the beginning. Significance was less than five percent on the first three tests. The figure ground was unchanged between the second and third test and then rose continuously, the trend carrying clear through to the sixth test. A gain of almost two points was registered between the first and fifth test with significance at the one percent level. None of the other comparisons showed any significance.

Form constancy, which has continued to be the most difficult perception for rural children showed a larger loss between the comparison of the first and second and first and third test, but it was more than made up between the first and fourth test and remained unchanged in the comparison of the first and fifth test. No significance could be established other than the comparison of the first and second test, and that was questionable (less than ten percent). The most interesting finding of all was encountered in the comparison of the first to the sixth test where the children had been above normal initially (10.3) and by the end of the sixth test had advanced 2.7 to a final average of 13.0. Significance, however, was not present. One might conclude that the various programs that these children underwent were only effective with the normal or above normal child.

This finding, however, is negated when one examines the comparison of the first to second test because the children also had an initial average above normal, but they registered a loss of 1.3 between the first and second test. In summary, it appears that the finding is interesting and that is all; that it was probably a chance phenomenon.

The figure ground data also starting out with an initial loss between the first and second and first and third test proved to be the most encouraging because a gain was registered in the first to the fourth and the first to the fifth tests. The children had not been too low in the beginning, but were near normal at the end. A large gain was again registered by the group in the first to sixth comparison, but since they were above normal to start with, the gain was probably a chance phenomenon the same as was found in form constancy.

The spatial relations displayed a gradual drop-off between the first and second, first and third, and first and fourth, but in the first to the fifth, a large advance was made in the first to fourth comparison so that children ended up with a final score above normal. Since the children had been ten in the beginning, one might conclude that no effect was felt here. However, one must remember than ten was given automatically to children under five years of age, and all of these children had been under five to begin with so the phenomenon of the dropping-off in score in the first three comparisons was probably the result of the children's becoming more than five years of age, and therefore, being given this test. One may therefore say in conclusion that the comparison of one to five was very important because it showed that the various programs had been effective in developing the child's perception of spatial relations.

It appears therefore that the children were overcoming their perceptual handicaps and/or were undergoing near normal perceptual development in figure ground, position in space and spatial relations. Some development was being made in eye motor coordination and possibly this development could also be considered normal.

The one highly indicative characteristic of rural children displayed here is the fact that they are not getting sufficient training in form constancy. Since it was demonstrated in Phase II that the Frostig developmental training program could be very effective in improving any perceptions which were emphasized. This form constancy finding indicates that most rural children should be given form constancy developmental training.

SUMMARY AND CONCLUSIONS

A study was made of children's visual perceptions as measured by the Frostig Visual Perceptions test. These perceptions include eye motor coordination, figure ground, form constancy, position in space and spatial relations. Five hundred and ten children were tested over a period of three years beginning in the summer of 1965 and ending in May of 1968. Some children were tested as many as six times. The objectives of the project were fourfold, and were investigated in phases as follows:

1. The relationship of visual perceptions to children of other cultures as compared with the dominant Anglo-Saxon culture, and the relationship to cultural deprivation.
2. The effectiveness of various types of programs in improving a child's visual perceptions.
3. A comparison of the visual perceptions test with Lee Clark reading readiness, Metropolitan Readiness, Goodenough-Harris and various others.
4. The development of children's visual perceptions over a period of eighteen to twenty-five months.

Phase I on the relationship of cultural deprivation to control group children concerned groups of children called non-culture who lived in Mexico, on the Navajo Reservation, or in a Laguna pueblo. The culturally deprived children were children who had been selected to participate in a special program offered through the auspices of the Office of Economic Opportunity. If a child had not been chosen for such training, he was considered to be a member of the control group. Culturally deprived programs studied included Navajo and Laguna Indian pre-Schools and programs in Grant County, New Mexico, of which Silver City is the county seat. The Silver City group consisted of Head Start and Child Development Center programs. The children who were in programs of a short duration, less than three months, were referred to as Head Start, and those in programs of longer length were called Child Development Center. Children came from: Silver City, Bayard, Hurley, Central, Fierro and Santa Rita. Programs investigated covered a period of three years beginning with the summer of the 1965 Head Start program and extending through the 1967-1968 Child

Development Center program.

The test scores of the culturally deprived children were compared with the test scores made by children in the control group. The control group included Navajo first grade; Teacher Education Center, Western New Mexico University (nursery, kindergarten and first grade); first grade children in Silver City and Deming (Luna County; and kindergarten children at St. Mary's Inter-Parochial School. All children involved in the study could be characterized as rural because the largest community involved in the study, Silver City, New Mexico, has a population of only 10,000.

The investigation revealed that all children, therefore, all rural children scored low in form constancy. The resultant averages of combined non-culture, culturally deprived, and all control group children were approximately 1.5 below norm which indicated a severe handicap on this perception.

It was further found that non-culture children have approximately the same perceptual development as control groups. The one exception was found in position in space where non-culture children scored 1.0 lower. It was hypothesized that this fact was due to the communications handicap encountered by non-culture children because of their speaking another language. On the other hand, culturally deprived children had displayed broad differences from the control group. Not only was it found that culturally deprived scored lower in all perceptions, but the incidence of visual perceptions handicaps as measured by the percent of children scoring under nine was sometimes as great as eight times that of the control.

The comparison of incidence of handicap revealed that culturally deprived children had rates of handicap which varied from two times as great in figure ground and form constancy, three times as great in eye motor coordination, and four times as great in position in space, and almost eight times as great in spatial relations. Further, the incidence among non-culture groups was not materially different except in the case of position in space. Where the incidence of handicap was about twice that of a control group, but when coupled with cultural deprivation, this incidence was doubled again. Cultural deprivation would also double the incidence of handicaps in spatial relations. The Navajo children tended to score high on spatial relations in comparison with Lagunas, and the Navajo average was even higher than the control group.

In Phase II of the study a number of programs were investigated in order to determine the effect such programs had on improving visual perceptions. The various programs included nursery, kindergarten, first grade, pre-first (a term applied in New Mexico to a program where children learn to speak English primarily), Indian pre-School, culturally deprived programs and Frostig Visual Perceptions Developmental Training Program. Children were pre-tested wherever possible, and again post-tested. The two means and T scores were then calculated and the significance of the difference between the mean was computed.

The investigation revealed that most programs had some effect. The significance of such effect could not be demonstrated always to a very high degree. The effect of several programs were indicated, but since the pre-test, post-test type investigation had not been utilized, the findings could not be considered valid. The most outstanding indication of the value of an effective program was displayed by the pre-first grade at Columbus, Luna County, New Mexico. On the other hand, the value of the Frostig developmental training program was thoroughly demonstrated. Children in this program made progress of one to three points in most perceptions following training.

A side study of the persistence of such training showed that the progress achieved by these students was retained over a period of at least one academic year. The amount of regression was not found to be of a significant level. The most outstanding finding here was that in several of the perceptions the children had actually advanced by more than one point during this post interim period.

Another unusual finding was that the advance was significant at a level sometimes less than two percent.

Although the Frostig training program had been effective, the seriousness of the handicap existing in form constancy made it impossible to achieve a normal level following the training program. Therefore, the effect of a second training program following the first was investigated. Although not significantly so, it appears that the second program could almost bring the child to a normal level in spite of a severe handicap in form constancy. The second training program had very little effect on the other perceptions of the child.

The Frostig training program given to a Head Start group for as short a period of time as three weeks was as effective as a training program extending over several months. From this finding, as well as the previous findings on persistence, it was inferred that visual perceptions training must be comparable to those dealing with threshold effects. Thus a child needs assistance in visual perceptions only in overcoming a threshold obstacle. Once he has been helped over the threshold, he can perceive with no further difficulty. It was concluded that approximately one hour of training on any one perception, providing it was divided up into short (five minute) sessions would be sufficient to overcome a given perceptual handicap unless that handicap was of a very severe nature (six or less).

How the Frostic Perceptions test compares with other tests in reading readiness and intelligance was investigated in Phase III. The Pearson's Product Moment was computed on test results received from the Frostig and other tests given at the same time. The Lee Clark Reading Readiness Test was the primary readiness instrument although the Metropolitan Readiness Test was administered. The Peabody Picture Vocabulary Test was a primary instrument for measuring mental ability. However, the Goodenough-Harris Draw A Man as well as several others were also utilized. Other mental tests investigated were the California Test of Mental Maturity, the Lorge-Thorndike, and the Vineland. The findings of this phase were that reading readiness correlates rather well with the Frostig. When a child was shown to have been in other programs such as the Child Development Center program or kindergarten, the effect of such a program was noted in that the correlation tended to drop. Thus the value of a correlation (.65) obtained from three weeks' training out of a five weeks' Head Start program yielded correlations which were almost .2 higher than was found in a group which had had two years of Child Development Center program. The lowest correlation was obtained for Navajo Indians and it was .3 below the Head Start correlation. Comparison of intelligence tests showed that the Peabody Picture Vocabulary Test had almost as high a correlation (.53) as the reading readiness. The Goodenough-Harris correlation (.24) was lowest but was almost exactly that derived by Sprague. Correlations obtained on the other mental ability tests varied widely but a comparison of these showed a correlation (.44) which was approximately the same as found by other researchers. It was concluded then that this part of the study had derived correlations which were approximately the same as reported in the literature.

The last phase concerned a selected sample of children who had been tested over a period of eighteen to twenty-five months and/or had taken five or six Frostig tests. A comparison of the results was made by examining the test results received on the child's first test with that made on the last test. The comparison showed that children did in fact make progress in three out of five perceptions. These were figure ground, position in space, and spatial relations. There was some indication that they had made sufficient progress also in eye motor coordination. The one perception where insufficient progress was demonstrated was form constancy. A comparison of the children who had taken five or six tests yielded approximately the same results.

As a final conclusion, the study has made its best contribution in the fact that it showed that handicaps are a cultural deprivation phenomena rather than a nondominant culture phenomenon. All children in rural areas experience a visual perceptions handicap in form constancy. The Frostig Visual Perceptions Developmental Training Program is highly effective even when given for a short duration.

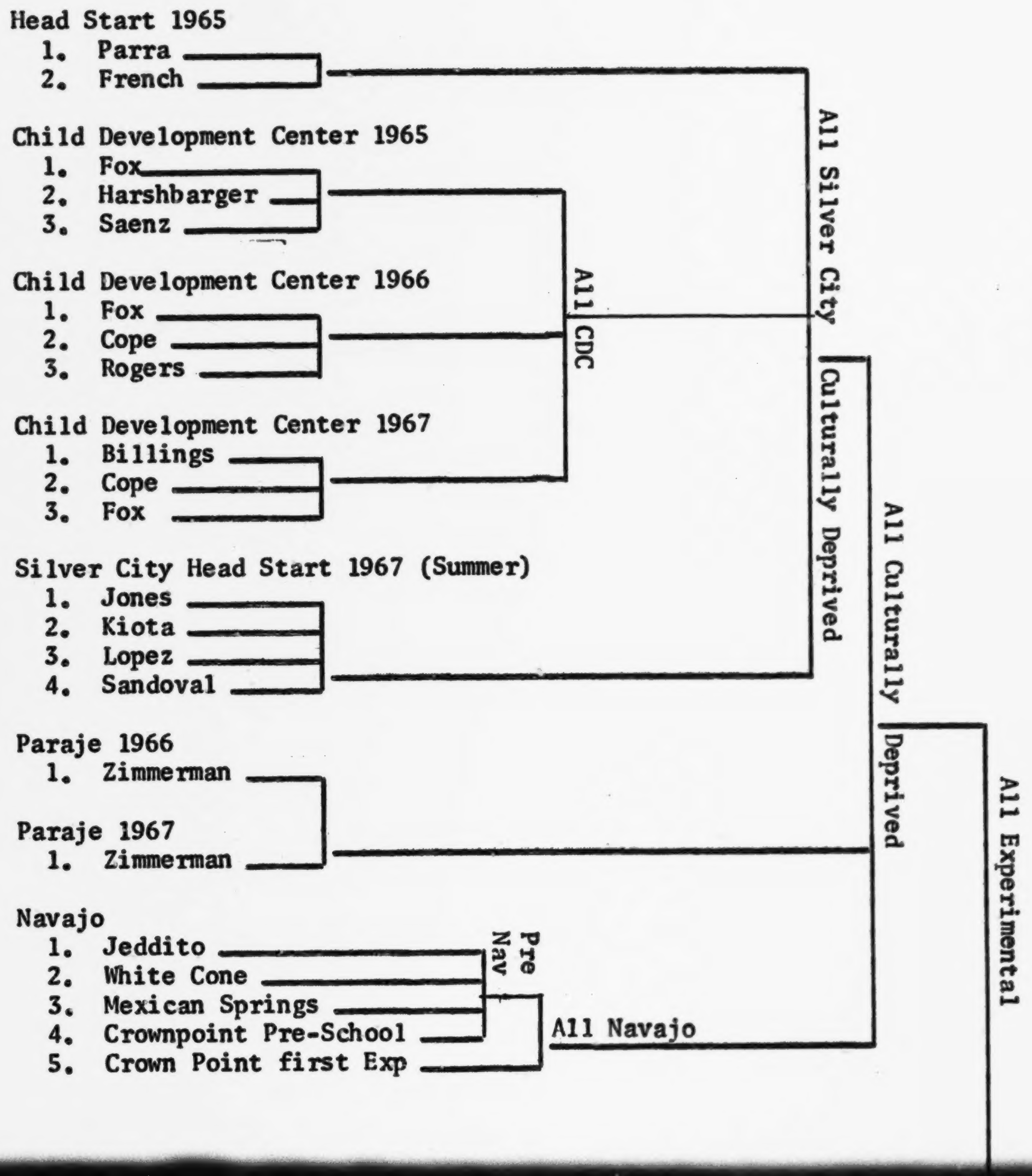
The study therefore concludes that rural children probably should all experience form constancy training furing their first year at school.

The study points up the need for further investigation on quite a number of questions. The low form constancy score is probably the most paramount since it could be the result of a flaw in the standardization of the test itself. The broad individual differences among Indian tribes has lead to the question of whether or not a further standardization on Indian populations alone should be made.

CHART 1

COMPARISON OF VARIOUS GROUPS
(All tests before training was received)

CULTURALLY DEPRIVED



Head Start 1965
1. Parra
2. French

Child Development Center 1965
1. Fox
2. Harshbarger
3. Saenz

Child Development Center 1966
1. Fox
2. Cope
3. Rogers

Child Development Center 1967
1. Billings
2. Cope
3. Fox

Silver City Head Start 1967 (Summer)
1. Jones
2. Kiota
3. Lopez
4. Sandoval

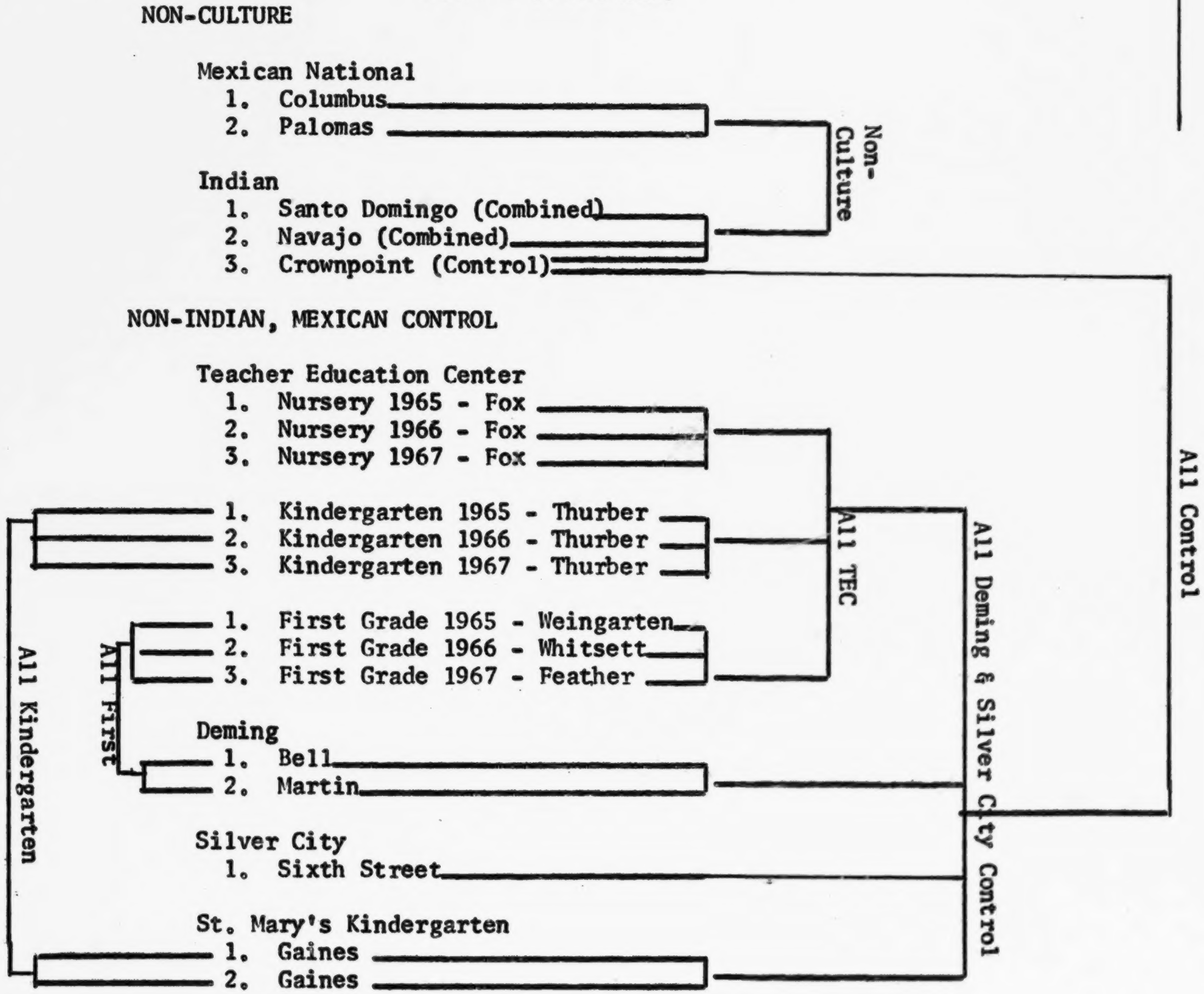
Paraje 1966
1. Zimmerman

Paraje 1967
1. Zimmerman

Navajo
1. Jeddito
2. White Cone
3. Mexican Springs
4. Crownpoint Pre-School
5. Crown Point first Exp

All CDC
All Silver City
Culturally Deprived
All Culturally Deprived
All Experimental
Pre Nav
All Navajo

CHART 1 (CONTINUED)



NON-CULTURE

Mexican National
  1. Columbus
  2. Palomas

Indian
  1. Santo Domingo (Combined)
  2. Navajo (Combined)
  3. Crownpoint (Control)

NON-INDIAN, MEXICAN CONTROL

Teacher Education Center
  1. Nursery 1965 - Fox
  2. Nursery 1966 - Fox
  3. Nursery 1967 - Fox

  1. Kindergarten 1965 - Thurber
  2. Kindergarten 1966 - Thurber
  3. Kindergarten 1967 - Thurber

  1. First Grade 1965 - Weingarten
  2. First Grade 1966 - Whitsett
  3. First Grade 1967 - Feather

Deming
  1. Bell
  2. Martin

Silver City
  1. Sixth Street

St. Mary's Kindergarten
  1. Gaines
  2. Gaines

Non-Culture
All Control
All TEC
All Deming & Silver City Control
All First
All Kindergarten

TABLE I

MEDIAN AND NUMBER OF SUBJECTS FOR CLASSROOMS OF CULTURALLY DEPRIVED, NON-ANGLO SAXON CULTURE AND CONTROL GROUPS

CULTURALLY DEPRIVED	Number of Subjects	Median
Head Start 1965		
1. Parra	15	7
2. French	13	2
Child Development Center'65-'66		
1. Fox	11	21
2. Harshbargar	17	11
3. Saenz	17	3
Child Development Center '66-'67		
1. Fox	3	14
2. Cope	6	20
3. Rogers	10	21
Child Development Center'67-'68		
1. Harrington	7	20
2. Cope	12	29
Silver City Head Start		
1. Jones	14	9
2. Kiota	14	15
3. Lopez	13	6
4. Sandoval	14	6
Paraje		
1. 1966	33	45
2. 1967	11	33
Navajo		
1. Jeddito	12	43
2. White Cone	16	70
3. Mexican Springs	17	46
4. Crownpoint Pre-School	15	41
5. Crownpoint 1st Exp.	11	30

NON-CULTURE	Number of Subjects	Median
Mexican National		
1. Columbus	24	39
2. Palomas	23	16
Indian		
Crownpoint Control	24	50
NON-INDIAN-MEXICAN CONTROL		
Teacher Education Center		
1. Nursery-Fox 1965	13	14
2. Nursery-Fox '66-67	12	30
3. Nursery-Vox '67-68	12	25
Teacher Education Center		
1. Kindergarten Thurber 1965	13	42
2. Kindergarten Thurber 1966-1967	12	68
3. Kindergarten Thurber	16	55
Teacher Education Center		
1. 1st - 1965	12	69
2. 2nd - 66-67	6	50
3. 3rd - 67-68	5	40
Deming		
1. Bell	22	38
2. Martin	19	29
Silver City		
1. Sixth Street	36	59
St. Mary's		
1. A.M.	26	61
2. P.M.	22	78

TABLE 2

COMBINED MEDIAN AND NUMBER OF SUBJECTS FOR CLASSROOMS OF CULTURALLY DEPRIVED NON-ANGLO SAXON CULTURE AND CONTROL GROUPS

	Number of Students	Median
CULTURALLY DEPRIVED		
Head Start 1965	29	7
Child Development Center 1965	45	9
Child Development Center 1966-67	19	16
Child Development Center 1967-68	19	24
All Child Development Center	83	16
Silver City Head Start	57	8
All Head Start	86	7
All Paraje	44	39
All Navajo	71	42
All Indian	115	41
All Culturally Deprived	283	20

	Number of Students	Median
NON-CULTURE		
All Mexican National	47	30
All Indian	139	45
All Non-Culture	186	40
NON-INDIAN-MEXICAN CONTROL		
Teacher Education Center		
Nursery	37	26
Kindergarten	41	55
First Grade	23	50
All Teacher Ed. Center	101	40
All Deming	41	35
All St. Mary's	48	69
All Non-Indian Mexican Control	211	42
All Control	235	50

TABLE 3

CALCULATED MEANS ON INDIVIDUAL TYPES OF PERCEPTIONS FOR EACH CLASSROOM

	n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
CULTURALLY DEPRIVED						
Head Start - 1965						
1. Parra	15	7.6	7.0	7.6	7.4	8.1
2. French	13	7.4	7.2	6.2	7.2	8.2
CDC - 1965						
1. Fox	11	7.9	7.5	9.5	8.4	10.0
2. Harshbargar	17	7.2	6.5	8.0	7.4	9.5
3. Saenz	17	7.7	7.1	8.2	9.1	9.6
CDC - 1966-1967						
1. Fox	3	9.7	7.0	7.3	7.3	8.7
2. Cope	7	8.7	7.9	8.1	8.3	9.3
3. Rogers	10	8.4	7.2	7.7	9.9	9.5
CDC - 1967-1968						
1. Harrington	7	9.4	8.1	8.0	8.0	8.9
2. Cope	12	9.2	7.8	7.6	8.6	10.1
Silver City Head Start						
1. Jones	15	8.1	8.3	8.0	7.1	7.4
2. Kiota	14	8.9	7.9	6.9	7.9	8.6
3. Lopez	13	9.1	7.5	7.2	6.8	7.6
4. Sandoval	14	9.2	8.9	6.6	6.9	8.0
Paraje 1967	34	10.4	9.5	8.9	9.0	9.3
Paraje 1968	14	9.6	9.9	10.1	9.6	9.9
Navajo						
1. Jeddito	12	11.6	10.5	7.6	8.6	9.6
2. White Cone	16	10.6	11.2	9.4	10.1	10.8
3. Mexican Springs	17	10.4	10.5	9.2	9.1	9.6
4. Crownpoint Pre	15	10.3	8.1	10.6	9.5	10.0
5. Crownpoint Exp	11	10.9	9.6	8.3	8.7	10.4

TABLE 3 (CONTINUED)

	n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
NON-CULTURE						
Mexican National						
1. Columbus	24	9.9	10.8	8.7	10.1	9.7
2. Palomas	23	8.3	8.3	8.0	8.4	8.4
Indian						
1. Crownpoint	24	11.7	9.8	7.6	9.2	11.1
NON-INDIAN-MEXICAN CONTROL						
Teacher Education Center						
1. Nursery - Fox '65	13	8.2	7.6	9.1	9.1	9.2
2. Nursery - Fox '66	13	8.6	8.2	9.2	10.4	10.0
3. Nursery - Fox '67	12	8.9	7.3	9.7	9.7	10.0
1. Kdg. - Thurber '65	14	10.3	8.4	7.9	9.5	10.2
2. Kdg. - Thurber '66	12	10.3	10.2	8.6	10.4	11.6
3. Kdg. - Thurber '67	16	9.7	9.3	8.8	10.8	10.5
1. First Grade '65 Weingarten	12	9.7	10.6	9.9	11.0	11.4
2. First Grade '66 Whitsett	6	10.5	9.9	9.0	0.7	11.0
3. First Grade '67 Feather	6	10.0	10.5	9.4	10.5	9.6
Deming						
1. Bell	22	9.3	9.7	8.7	9.6	10.5
2. Martin	19	10.1	8.9	7.9	8.4	9.3
Silver City						
1. Sixth Street	35	10.1	10.6	8.9	10.5	11.1
St. Mary's Kdg.						
1. A.M.	26	9.8	10.3	8.9	10.6	12.0
2. P.M.	22	11.0	11.2	8.3	11.5	12.2

TABLE

CALCULATED MEANS ON INDIVIDUAL TYPES OF PERCEPTIONS FOR COMBINED CLASSROOMS

	n	Eye Motor	Figure Ground	Form Constancy	Position in space	Spatial Relations
CULTURALLY DEPRIVED						
Head Start 1965	28	7.5	7.1	7.0	7.3	8.1
CDC 1965	45	7.6	6.9	8.6	8.3	9.7
CDC 1966-67	20	8.7	7.4	7.8	8.6	9.3
CDC 1967-68	19	9.3	7.9	7.7	8.5	9.6
All CDC	84	8.2	7.3	8.2	8.6	9.6
Silver City Head Start	56	8.8	8.2	7.2	7.2	7.9
All Head Start	84	8.4	7.8	7.0	7.1	7.9
Paraje 1967-68	48	10.2	9.6	9.3	9.2	9.5
All Navajo (Not Crownpoint Experimental)	60	10.7	10.1	9.3	9.4	10.0
All Indian (with Crownpoint Exp)	119	10.5	9.8	9.2	9.2	9.4
All Culturally Deprived	287	9.2	8.5	8.3	8.4	9.0
NON-CULTURE						
All Mexican National	47	9.1	9.6	8.4	9.3	9.1
All Indian	143	10.7	9.8	8.9	9.2	10.0
All Non-Culture	190	10.3	9.8	8.8	9.2	9.8
NON-INDIAN-MEXICAN CONTROL						
Teacher Education Center						
All Nursery	38	8.6	7.7	9.3	9.7	9.7
All Kindergarten	42	10.7	9.3	8.4	10.2	10.7
All First Grade	24	10.0	10.4	9.6	10.5	10.9
All TEC	104	9.5	9.0	9.0	10.1	10.4

TABLE [illegible] (CONTINUED)

	n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
All Deming	41	10.0	9.4	8.3	9.3	10.0
All St. Mary's	48	10.3	10.7	8.6	11.0	12.1
All Non-Indian-Mexican Control		10.0(n228)	9.6(n228)	8.8(n225)	10.2(n226)	10.8(n225)
All Control		10.0(n252)	9.7(n252)	8.7(n249)	10.1(n250)	10.2(n249)

TABLE 5

CALCULATED PERCENT AND NUMBER OF CHILDREN SCORING UNDER 9 (NO PREVIOUS TRAINING)

	n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
CULTURALLY DEPRIVED						
Head Start 1965						
1. Parra	15	67	93	67	73	73
2. French	13	69	85	85	69	54
Child Development Center - 1965						
1. Fox	11	87	82	55	55	0
2. Harshbargar	17	82	94	65	47	18
3. Saenz	17	82	94	65	88	24
Child Development Center - 1966						
1. Fox	3	0	100	100	33	67
2. Cope	6	67	17	50	67	17
3. Rogers	10	62	100	70	20	10
Child Development Center - 1967						
1. Billings	7	14	57	71	71	71
2. Cope	12	25	67	67	33	17
Silver City Head Start - 1967 (Summer)						
1. Jones	16	56	63	69	81	81
2. Kiota	14	43	79	86	71	57
3. Lopez	12	38	69	77	69	85
4. Sandoval	14	36	50	71	86	71
Laguna (Paraje)						
1. Zimmerman- 1966	33	0	18	21	21	33
2. Zimmerman- 1967	23	26	39	26	26	22
Navajo						
1. Jeddito	12	8	0	58	33	17
2. White Cone	16	13	19	38	25	0
3. Mexican Springs	17	18	18	47	42	6
4. Crownpoint Pre	15	13	80	13	27	0
5. Crownpoint First	11	27	45	55	55	27

TABLE 5 (CONTINUED)

n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
NON-CULTURE					
Mexican Nationals					
1. Columbus	25	13	42	29	29
2. Palomas	65	57	52	61	30
Crownpoint Control	0	17	75	33	4
NON-INDIAN-MEXICAN CONTROL					
Teacher Education Center					
1. Nursery - '65-'66	62	85	58	31	15
2. Nursery - '66-'67	38	62	50	8	0
3. Nursery - '67-'68	25	92	33	33	0
1. Kindergarten-'65-'66	29	64	46	15	8
2. Kindergarten-'66-'67	8	25	50	8	0
3. Kindergarten-'67-'68	13	38	31	13	13
1. First - '65-'66	25	17	42	17	0
2. First - '66-'67	17	33	17	33	17
3. First - '67-'68	17	17	40	0	20
Deming Schools					
1. Bell	9	5	32	5	0
2. Martin	40	42	63	37	37
Silver City					
1. Sixth Street and North Silver	14	22	39	83	0
St. Mary's Interparochial					
1. A.M.	15	23	38	12	4
2. P.M.	10	18	36	45	45

TABLE 6

CALCULATED PERCENT AND NUMBER OF SUBJECTS FOR COMBINED GROUPS CHILDREN UNDER 9 IN A GIVEN SUBTEST

	n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
CULTURALLY DEPRIVED						
Head Start 1965	28	68	90	75	71	64
CDC 1965-66	45	82	91	62	64	16
CDC 1966-67	19	53	95	68	37	21
CDC 1967-68	19	21	63	68	47	37
All CDC	83	61	86	65	54	22
Head Start 1967	57	44	63	78(n55)	80	76
All Silver City Culturally Deprived		57(n168	79(n168)	71(n167)	66(n166)	47(n168)
Laguna(Paraje)	56	10	27	23	23	29
Navajo Pre-School	71	15	32	41	35	8
All Navajo	95	12	28	49	35	7
All Indian	151	11	28	40	30	15
All Culturally Deprived	295	38.0	58.0	54.8(n294)	50.2(n293)	34.1
NON-CULTURE						
All Mexican Nat'l	47	43	32	45	43	28
All Non-Culture	198	19	29	41	34	19

TABLE 6 (CONTINUED)

	n	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
CONTROL						
Teacher Education Center						
Nursery	38	42	81	46(n37)	24	5
Kindergarten	42	17	43	41(n41)	12	7
First	24	21	21	35(n23)	13	9
All TEC	104	27	51	42(n101)	17	7
Deming	41	15	22	46	20	17
St. Mary's Kdg	48	13	21	38	8	4
All Silver City Control	188	39	71	74(n185)	24	9
All Silver City and Deming Control	288	20	35	41(n226)	14	7
All Kindergartens	90	15	31	39(n89)	10	6
All Firsts	101	16	22	41(n100)	14	9
All Control	253	18.0	33.6	44.4(n250)	16.0	5.9

TABLE 7

COMPUTED MEANS AND SIGNIFICANCE OF 1965 HEAD START, KINDERGARTEN, CHILD DEVELOPMENT CENTER, PUBLIC SCHOOL FIRST AND INDIAN

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
EFFECT OF KINDERGARTEN TRAINING					
Teacher Education Center Kindergarten					
Pre-Test (11/65)	10.1	8.5	8.4	9.6	9.9
Post-Test (5/66)	10.2	10.9	10.0	12.6	11.8
Significance (n10)	<20%	<20%	>20%	<10%	<20%
Child Development Center(Fox)- 1965-1966					
Pre-Test	8.1	7.6	9.9	8.6	10.0
Post-Test	9.4	8.8	9.0	9.7	10.0
Significance (n10)	<10%	<5%	<20%	<20%	0%
Child Development Center (Harshbargar)					
Pre-Test	9.1	6.4	7.6	7.4	9.1
Post-Test	8.3	6.8	8.9	8.1	8.9
Significance	<5%	<20%	<10%	<0.1%	>20%
Child Development Center (Saenz)					
Pre-Test	7.6	7.2	8.5	9.5	9.7
Post-Test	9.0	7.2	7.4	9.1	9.3
Significance	<5%	0%	<10%	>20%	<20%
Child Development Center Total					
Pre-Test	7.6	7.0	8.5	8.4	9.5
Post-Test	8.8	7.4	8.4	8.8	9.3
Significance	<0.1%	<2%	>20%	<20%	>20%
Child Development Center 1966-1967					
Pre-Test	9.0	7.4	8.5	8.8	9.4
Post-Test	9.7	8.0	7.7	8.3	9.3
Significance (n66)	<20%	<20%	10%	<20%	>20%

TABLE 7 (CONTINUED)

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
Overall (4/66 - 3/67)					
Pre-Test	7.8	7.1	8.8	8.8	9.7
Post-Test	9.8	8.2	7.7	8.5	9.4
Significance	0.1%(n30)	<20%	10%	>20% (n29)	<20% (n30)
Head Start 1965					
Pre-Test	7.5	7.1	7.0	7.2	8.1
Post-Test	10.2	9.0	7.3	9.1	9.3
Significance(n16)	2%	5%	>20%	<2%	2%
EFFECT OF FIRST GRADE					
Paraje 1967-1968					
Pre-Test (6/67)	9.4	8.9	10.3	8.2	8.6
Post-Test (2/68)	9.2	9.3	9.1	10.0	9.2
Significance (n9)	>20%	>20%	<20%	10%	<20%
Silver City First Grade (Comparison of Means only)					
Pre-Test (12/67)	10.4	10.4	8.9	10.7	11.0
Post-Test(4/68)	10.4	10.3	8.9	10.4	11.0

TABLE 8

CALCULATED MEANS AND SIGNIFICANCE FOR FROSTIG DEVELOPMENTAL TRAINING GIVEN ONE TIME ONLY

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
CULTURALLY DEPRIVED					
Child Development Center					
1966-1967					
Pre-Test	9.1	7.7	7.6	8.3	9.2
Post-Test	9.5	9.0	8.8	9.1	9.0
Significance	<20%(n43)	<0.1%(n43)	<1%(n43)	<10%(n43)	>20%(n43)
1967-1968					
Pre-Test	9.1	8.5	7.6	8.3	9.8
Post-Test	8.8	8.6	10.8	11.8	10.8
Significance	<20%(n10)	<20%(n10)	>10%(n10)	>5%(n10)	>10%(n10)
All Child Development Center					
Pre-Test	9.3	7.9	7.6	8.3	9.3
Post-Test	9.4	8.9	9.2	9.6	9.4
Significance	>20%(n53)	<1%(n53)	<1%(n53)	<1%(n52)	>20%(n52)
Head Start 1967					
Pre-Test (6/67)	8.9	8.2	7.2	7.1	8.0
Post-Test (7/67)	9.0	8.9	8.3	9.8	9.1
Significance	>20%(n49)	<2%(n49)	<0.1%(n46)	<0.1%(n46)	<0.1%(n46)
ALL SILVER CITY CULTURALLY DEPRIVED					
Pre-Test	9.1	8.0	7.4	7.8	8.7
Post-Test	9.2	8.9	8.8	9.7	9.2
Significance	>20%(n102)	<1%(n102)	<1%(n99)	<1%(n98)	>20%(n96)
INDIAN					
Crownpoint Pre-School					
Pre-Test (9/67)	9.9	8.1	10.6	9.4	10.0
Post-Test (5/68)	10.1	9.4	13.1	10.6	10.0
Significance	>20%(n9)	<10%(n9)	<10%(n9)	<20%(n9)	0.0

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	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
CONTROL GROUPS					
Teacher Education Center					
Kindergarten 1966-1967					
Pre-Test (11/66)	10.2	10.6	8.2	10.9	12.2
Post-Test(2/67)	10.6	12.3	9.0	13.1	10.4
Significance	<20%(n9)	<10%(n9)	<20%(n9)	<10%(n9)	<10%(n9)
Kindergarten 1967-1968					
Pre-Test (1/68)	9.8	9.4	9.0	11.3	10.6
Post-Test (5/68)	9.9	10.0	8.8	12.1	12.3
Significance	<20%(n16)	<20%(n16)	>20%(n16)	>20%(n16)	> 5%(n16)
First Grade 1967-1968 Not Calculated Separately					
Total Teacher Education Center					
Pre-Test	9.9	9.8	8.7	10.0	10.9
Post-Test	10.2	11.1	9.3	11.4	11.6
Significance	20%(n30)	10%(n30)	20%(n29)	20%(n30)	20%(n29)
Total All Children (Child Development Center + Head Start 1967 + Teacher Education Center)					
Pre-Test	9.3	8.4	7.7	8.5	9.2
Post-Test	9.4	9.4	8.9	10.3	9.8
Significance	<20%(n132)	<0.1%(n132)	<0.1%(n128)	< 0.1%(n128)	<1%(n125)

TABLE 9

CALCULATED MEANS AND SIGNIFICANCE FOR FROSTIG TRAINING PROGRAMS GIVEN A SECOND TIME

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
RESULTS OF SECOND TRAINING (PRE-TEST 2 VS POST-TEST 2)					
Pre	9.3	10.7	8.9	10.1	9.9
Post	9.2	10.6	11.4	11.8	10.5
Significance	>20%(n13)	>20%	5%	<5%	< 20%
OVERALL EFFECT OF TWO TRAINING PROGRAMS (PRE-TEST 1 VS POST-TEST 1)					
Child Development Center and Teacher Education Center					
Pre	8.9	8.4	8.6	10.1	11.0
Post	9.6	10.7	11.4	11.1	10.5
Significance	2%	2%.	5%	5%	20%
PERSISTENCY OF FIRST TRAINING DEVELOPMENT (POST-TEST 1 VS PRE-TEST 2)					
Pre (7/67)(Post-Test 1)	9.8	9.0	9.9	10.9	9.9
Post (1/68)(Pre-Test 2)	9.4	10.5	8.8	10.5	9.9
Amount of Change	- .4	+15.0	-1.1	- .4	.0
Significance	<20%	10%	<20%	>20%	none
PERSISTENCE IN FOLLOW-UP STUDIES					
Child Development Center from 7/67 to 1/68					
Pre	8.9	7.1	8.5	8.8	9.4
Post	9.6	8.0	7.7	8.3	9.3
Significance(n29)	<20%	<5%	<10%	<20%	>20%
PERSISTENCE OF ACHIEVEMENT MADE AFTER FROSTIG TRAINING					
Child Development Center from 7/67 to 5/68					
Pre	9.7	8.2	8.5	9.2	8.8
Post	9.1	9.0	10.1	10.9	9.9
Significance (n10)	>20%	<20%	<20%	<10%	<20%

TABLE 9 (CONTINUED)

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
PERSISTENCE OF ACHIEVEMENT MADE AFTER FROSTIG TRAINING					
Head Start (Summer 1967)					
Pre	9.1	8.9	8.0	9.4	9.0
Post	9.4	8.9	7.4	10.1	10.2
Significance(n34)	< 20%	>20%	<20%	<20%	<0.1%
PERSISTENCE TOTALS FOR HEAD START 1967 AND CHILD DEVELOPMENT CENTER 1967					
Pre	9.2	8.7	8.1	9.4	8.8
Post	9.3	9.0	8.0	10.3	9.9
Significance (n44)	<20%	<20%	>20%	<5%	< 0.1%

TABLE 10

CALCULATED MEANS AND SIGNIFICANCE FOR FROSTIG TRAINING PROGRAM GIVEN TO SUBJECTS WHO SCORE AT HANDICAP LEVEL (UNDER 9)

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
All Child Development Centers					
Pre-Test	7.6	7.2	6.8	6.5	7.2
Post-Test	8.7	8.0	9.0	9.2	8.1
Significance	<5%(n18)	<2%(n40)	<0.1%(n37)	<0.1%(n25)	<20%(n13)
All Head Start 1967					
Pre-Test	6.9	6.9	6.7	6.2	7.3
Post-Test	8.4	7.9	8.0	9.7	8.4
Significance	<10%(n14)	<5%(n19)	<1%(n23)	<1%(n23)	<1%(n22)
All Culturally Deprived (Child Development Center + Head Start 1967)					
Pre-Test	7.3	7.1	6.8	6.4	7.3
Post-Test	8.6	8.0	8.6	9.4	8.3
Significance	<1%(n32)	<1%(n59)	<0.1%(n60)	<0.1%(n48)	<0.1%(n35)
All Children (Child Development Center, Head Start 1967, Teacher Education Center)					
Pre-Test	7.4	7.1	6.6	6.4	7.4
Post-Test	8.7	8.4	8.5	9.5	8.4
Significance	<1%(n37)	<0.1%(n69)	<0.1%(n70)	<0.1%(n50)	<1%(n38)

TABLE 11

PIERSON PRODUCT-MOMENT CORRELATIONS FOR FROSTIG VS. LEE CLARK READING READINESS TESTS FOR INDIVIDUAL CLASSROOMS

	Number of Students	r
Headstart 1967		
Jones	12	.74
Kiota	10	.62
Lopez	11	.55
Sandoval	10	.73
Child Development Center 1967 Summer		
Fox	13	.48
Cope	11	.62
Child Development Center 1968 Spring		
Billings	10	.55
Cope	11	.50
Crownpoint Experimental	10	.38
Crownpoint Control	22	.38
Teacher Education Center		
First Grade-1967 Fall	11	.62
Kindergarten-1968 Winter(Pre)	17	.78
Kindergarten-1968 Spring(Post)	16	.72
St. Mary's Kindergarten-1968		
A.M.	25	.47
P.M.	22	.63

TABLE 12

PIERSON PRODUCT - MOMENT CORRELATIONS FOR FROSTIG VS. LEE CLARK READING READINESS TESTS FOR COMBINED GROUPS

	n	*r*
All Headstart 1967 (Summer	43	.64
All CDC 1967 (Summer)	24	.56
All CDC 1968(Spring)	21	.49
ALL CDC	128	.53
All Silver City Experimental	88	.58
ALL EXPERIMENTAL	98	.56
All Indians (Crownpoint first)	32	.38
All TEC	44	.74
All first grades*	43	.46
All St. Mary's	47	.53
All Kindergartens**	30	.58
All Non-Frostig Training***	64	.58
All Silver City Control	91	.55
ALL CONTROL	113	.53

* TEC and Crownpoint
** TEC and St. Mary's
*** TEC Kindergarten Pre-Test and St. Mary's

TABLE 13

CORRELATIONS AND NUMBER OF SUBJECTS FOR COMPARISON OF FROSTIG WITH OTHER TESTS

	n	Correlation
Child Development Center 1965-1966	14	.08
Child Development Center 1966-1967		
1. Cope-Saenz	21	.52
2. Fox	28	.09
Combined 1966-1967	49	.23
All Child Development Center	63	.53
Metropolitan 1965 Head Start	28	.34
Goodenough Harris 1966-1967 Child Development Center	28.	.24
Lorge Thorndike 1966-1967 - Teacher Education Center	14	.51
California Mental Maturity 1967-1968 Teacher Education Center (First)	10	.06
Combined Teacher Education Center Mental Tests	24	.49
Vineland Test of Mental Maturity 1965-1966 Child Development Center	14	.31
Combined Teacher Education Center and Child Development Center on Mental	38	.44

TABLE 14

CALCULATED MEANS AND SIGNIFICANCE ON SUBJECTS
18 - 25 MONTHS AFTER FIRST FROSTIG

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
Groups with Test 1 and 5					
Pre-Test (4/66)	7.7	7.4	10.2	8.8	9.6
Post-Test(11/67)	9.4	8.7	9.0	10.2	10.5
Significance	<10%(n11)	>20%(n11)	<20%(n11)	<20%(n12)	<20%(n12)
Total with 1 or 2 vs 5 or 6 Groups					
Pre-Test	8.1	7.6	9.7	9.1	9.6
Post-Test	9.2	9.4	9.7	10.8	10.4
Significance	<10%(n25)	<1%(n25)	0.1%(n25)	< 5%(n25)	< 5%(n25)

TABLE 15

CALCULATED MEANS AND SIGNIFICANCE OF CHILDREN WHO TOOK FIVE OR SIX TESTS

	Eye Motor	Figure Ground	Form Constancy	Position in Space	Spatial Relations
1 to 2					
Pre-Test	7.9	7.9	10.1	9.6	10.0
Post Test	9.1	8.1	8.8	9.4	9.8
Significance	<5%	<20%	<10%	>20%	<20%
1 to 3					
Pre-Test	7.9	7.8	9.9	9.5	10.0
Post-Test	9.4	8.1	8.2	8.1	9.7
Significance	<5%	>20%	<20%	<20%	>20%
1 to 4					
Pre-Test	7.9	7.8	9.6	9.5	10.0
Post-Test	9.6	8.7	8.9	9.3	9.4
Significance	<5%	<20%	<20%	>20%	<10%
1 to 5					
Pre-Test	7.9	7.8	9.9	9.5	10.0
Post-Test	8.9	9.7	8.9	9.9	10.5
Significance	<20%	1%	<20%	>20%	<20%
1 to 6					
Pre-Test	8.8	9.0	10.3	10.3	10.0
Post-Test	7.5	10.8	13.0	12.0	10.0
Significance	<20%	<20%	20%	>20%	0%